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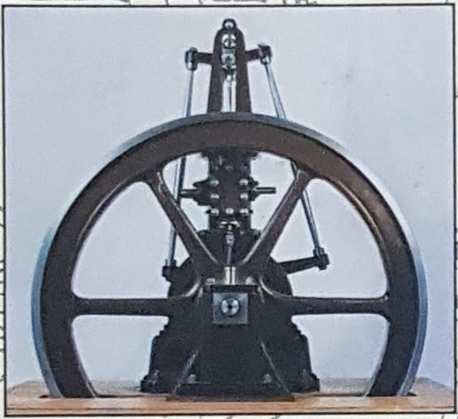

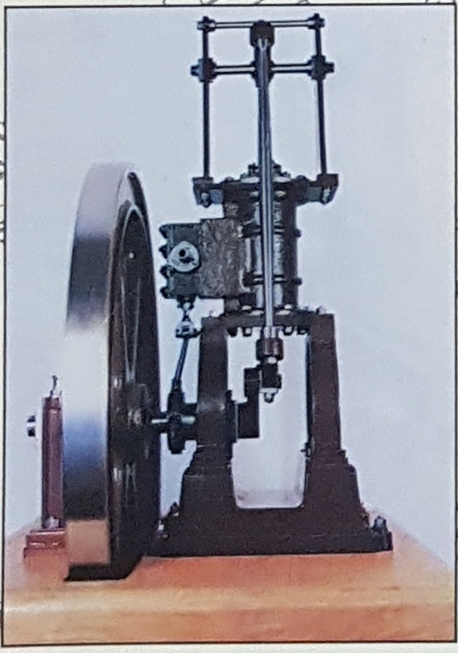

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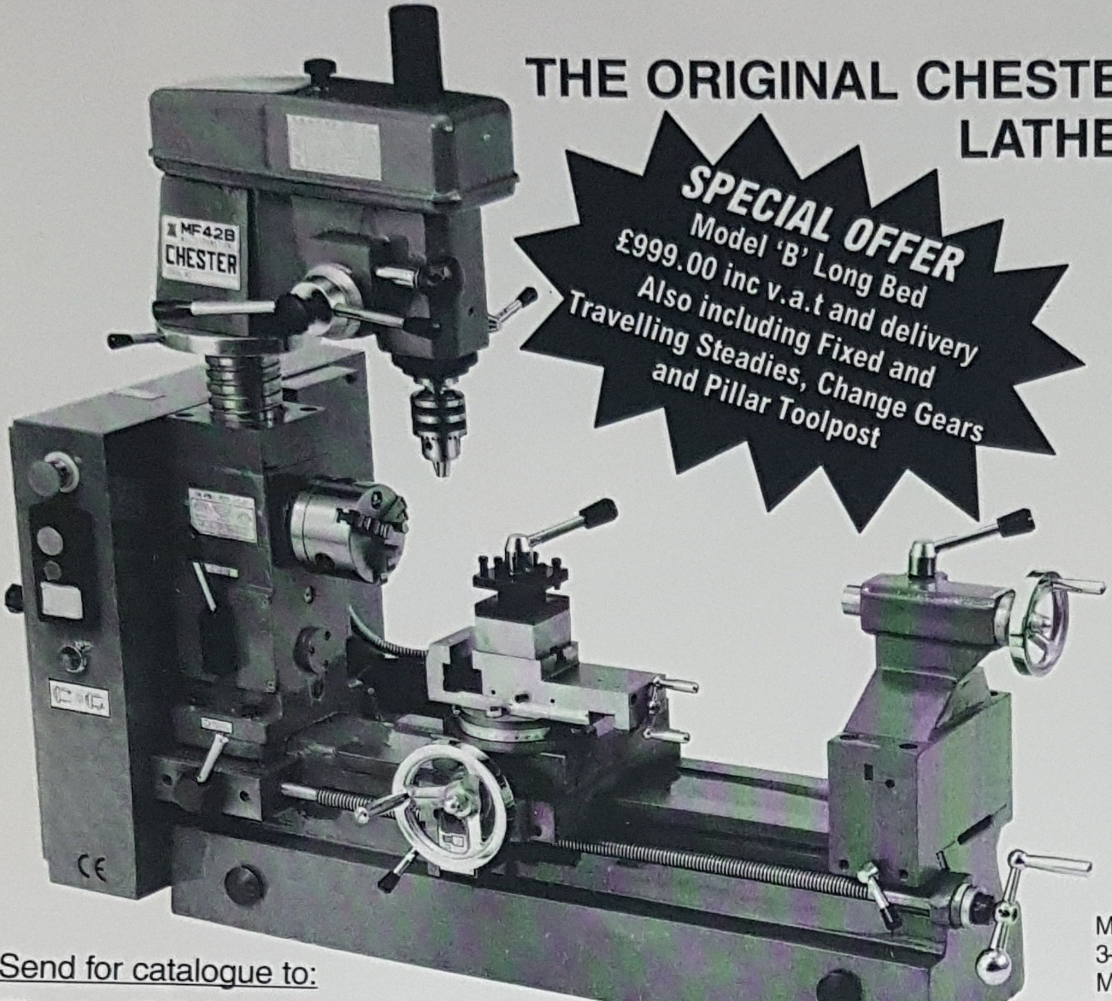

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COVER PICTURE

Three views of the subject of Anthony Mount's new construction series – Reuleaux's Trapezium Connecting Rod Engine – which begins on page 3. Photographs by Anthony Mount.

IN NEXT MONTH'S ISSUE

A 3-ton Double Acting Steam Hammer
LNWR 0-6-2T 'Coal Tank' Locomotive in 5" gauge
The Robey No. 4 Light Traction Engine
Constructing a Year Going Longcase Clock
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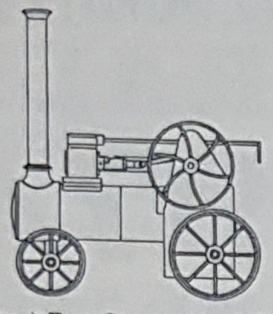

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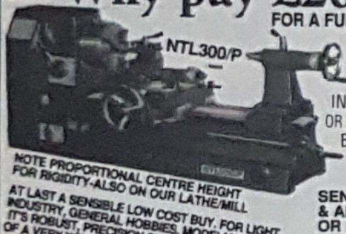

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19th & 20th JULY 1997
11.00 am - 5.30 pm Each Day

- **Model Traction Engines**
- **Steam Boats**
- **Steam Train Rides**
- **Workshop Demonstrations**
- **Railways from 00 to 7¼" gauge**
- **Trade Stands**
- **Refreshments**
- **Free Car Park**

Adult £5.00 Child £2.50 Senior Citizen £2.50 Family £10.00
GUILDFORD MODEL ENGINEERING SOCIETY

Bill Newcombe Steam Models
presents
FOUR NEW ENGINES
RUSTON PROCTOR in 6" scale
Class SD Single Cylinder Steam Tractor.
(Similar in size to 4" Garrett & 4" Foster)
ALFRED DODMAN in 4" scale
Single Crank compound of 1893.
FOSTER in 4" scale
Double Crank compound.
FOWLER BB1 in 4" scale
Ploughing engine.

Still Available:

Garrett in 4" scale
7nhp Single Cylinder
Agricultural Engine

Ruston Proctor
in 4" scale
Class SD Single
Cylinder Steam
Tractor

Send 50p in stamps for new detailed catalogue

Enterprise Works, Enterprise Road, Raunds,
Northants NN9 6JE
Telephone 01933 461919

G & M TOOLS

CURRENT USED STOCK LIST

LATHES

NEW! Emco Compact 5 CNC Lathe Mark 4, 1ph, 8 Tool Turret	£2650.00
Hardinge HSL59 Second Op Lathe, Compound Slide, 3ph	£1200.00
Maximat V10 Lathe, Milling Head, Tooling, 3ph	£1200.00
Emcomat 7 Lathe and Tooling	£600.00
Perris PL100 Screwcutting Bench Lathe, Tooled, 1ph	£300.00
Boxford BUD 4.1/2" x 18", 3ph, Tooled	£900.00
Boxford Model C, 4.1/2" x 18", 3ph, 3 Jaw Chuck	£350.00
Boxford TUD, 4.1/2" x 18", 3ph, Plain Lathe	£350.00
Colchester Bantam 1600, 5"x20" Lathe, 3ph	£1250.00
Colchester Student Round Head 6"x 25", Tooling, Choice of 3	£1100.00
Harrison M300 Centre lathe, 6" x 40", 3ph, Gap Bed, Choice of 3	£3000.00
Harrison L5A 11" Centre Lathe, Tooling, 3ph	£1250.00
Harrison L5 9"x 25" Lathe & Tooling, VGC	£950.00
Raglan Variable Speed Lathe, 3ph	£750.00
Smart & Brown Model L Plain Lathe, 3ph	£500.00
CVA 10"x30" Toolroom Lathe, Tooled	£1000.00
Modern No.2 Capstan Lathe, Collets, Bar Feed	£350.00
Boley & Leinen Watchmakers Lathe, Toolrest, Collets, Boxed	£225.00
Derbyshire Watchmakers Lathe Bed & Headstock only	£100.00
Wolf Jahn Watchmakers Lathe, 16 Ass. Collets, Box, Handrest (No motor)	£250.00
G Boley Watchmakers Lathe inc Compound slide, Hand Rest, 2 Tailstocks, collets, Drive Unit etc	£400.00
Schaublin 70 Lathe Bed, Headstock & Tailstock only	£200.00
Denford Starturn 4 DNC Lathe, Manuals, Tools, VGC, 1phase	£850.00
EME Microturn CNC Bench Lathe, Manuals, 1ph, Choice of 2	£500.00

DRILLING MACHINES

Boxford Union Floor Standing Pillar Drill, 5 speed, 3ph	£250.00
Elliott Progress Pillar Drill, 3ph	£250.00
Fobco Star Pillar Drill, 3ph, VGC	£325.00
Oldack High Speed Bench Drill, 0 - 1/4" Cap., 3ph	£150.00
Delta Radial Drill Press (unused)	£150.00
Startrite Mercury Bench Drill, 1ph, VGC	£285.00
Meddings 1/2" Cap. Bench Drill, 3ph	£175.00
Startrite Mercury Bench Drill, fitted speed reducer, 3ph	£250.00
Hauser Instrument Makers Drilling Machine for restoration,	£50.00
Niigata Type 10ST Vibrating Tapping Machine	£500.00
Superior Tapping Machine 5/8" Cap. (large, old)	£250.00
Pollard 1MT Pillar Drill, 3ph	£200.00

MILLING MACHINES

NEW Emco F1 CNC Milling Machine, 1ph	£3500.00
Harrison Vertical/Horizontal Milling Machine, 3ph	£1650.00
Denford Vertical Turret Type Mill, R8 Spindle, Power Feed, 3ph	£2250.00
Tom Senior M1 Horizontal/Vertical, VGC, 3ph	£1250.00
Boxford VM30 Vertical Mill 30 Int Spindle, Tooling, 3ph	£1450.00
Harrison Horizontal Milling Machine, Power Feed, 3ph	£875.00
Warco RF30 Major Mill/Drill, Vice, 1ph	£950.00
Warco RF20 Mill/Drill, 1ph, VGC	£775.00
Omega No.1 Jig Borer with Tooling, DRO, Nelsa Guards	£1500.00
BCA Jig Borer, 1ph, tooled	£850.00
Taylor Hobson Model K Engraver, 1ph, VGC,	£1750.00
Taylor Hobson Engraver, fitted Grinder, Type, 3ph	£850.00

POWER HACKSAWS

Warco Power Hacksaw, 1ph	£350.00
Qualters and Smith 8" Power Hacksaw	£500.00
Qualters and Smith B6W Horizontal Bandsaw, 3ph	£550.00
Kingsley 6" Power Hacksaw, 3 ph	£275.00
SIP 9" Metal Cut Off Saw, Coolant, Vice, 1HP, 1 Phase, NEW	£385.00
SIP 9" x 16" Horizontal Band Saw, 1ph, 4 Speed, (List £2650)	£1950.00
SIP 7" x 12" Horizontal Band Saw, 1ph, 4 Speed, (List £890)	£625.00
Export Brown Automatic Cold Saw, 3ph	£1000.00
Wellsaw 4" Power Hacksaw, 3 phase	£300.00

GRINDERS, LINISHERS, POLISHERS

Capco Surface Grinder, 18" x 6", Mag Chuck, 3ph	£650.00
Eagle Surface Grinder, 18" x 6" Cap., Mag Chuck, 3ph, ...Choice	£750.00
Dormer Model 53 Tool & Cutter Grinder, well tooled	£1250.00
Boxford Union Tool and Cutter Grinder, Cabinet, Tooling, 3 ph	£800.00
Wolf 6" Bench Grinder (3ph)	£50.00
Union Jubilee 10" Pedestal Grinder, 3ph	£125.00
Ortlieb Drill Grinder, 3ph	£300.00
Viceroy Double Ended Buffer, 3ph	£250.00
Viceroy Double Ended Buffer, 3 ph, 1HP	£300.00
RJH Bison Buffer/Grinder, 3ph	£225.00

SHAPERS

Bartsch Hydraulic Shaper, 180mm stroke	£350.00
Elliott 10M Shaper, 3ph	£300.00
Elliott 14" Shaper, 3ph	£450.00
Invicta 14" Shaper, 3ph	£450.00
Alba 1A Shaper, Vice, 3ph	£250.00
Boxford 8" Shaper with Vice, 3ph	£400.00
17"x13" Tilting Table for Elliott Shaper	£100.00
Brook 14" Shaper, 3ph	£450.00

BOXFORD SPARES & TOOLING

Change Gears(Also fit Southbends).
16T-£10, 18T-£11, 20T-£11, 21T-£11, 22T-£11, 23T-£11, 24T-£11, 26T-£11, 27T-£11, 28T-£11, 30T-£12, 31T-£12, 32T-£12, 35T-£12, 36T-£12, 37T-£12, 38T-£14, 40T-£14, 41T-£14, 43T-£14, 44T-£14, 45T-£14, 46T-£14, 48T-£14, 50T-£15, 52T-£15, 53T-£15, 54T-£15, 56T-£15, 59T-£15, 60T-£15, 64T-£15, 71T-£18, 75T-£18, 79T-£18, 80T-£20, 88T-£22, 100T-£25, 127T-£30.

100/127T Compound Gear	£55.00
54/18T Compound Gear	£30.00
72/18T Compound Gear	£35.00
32T Tumbler Reverse Gear	£12.00
5" Catchplate	£15.00
6" Backplate	£20.00
4" Backplate	£18.00
Boxford Faceplates	£38.00
Pratt Burnerd 4" 4 Jaw Chuck	£75.00
Boxford 6" Pratt Burnerd 4 Jaw Chuck	£85.00
Boxford Imperial or Metric Cross Slide Nuts (New)	£38.00
Boxford Imperial or Metric Cross Slide Screws (New)	£88.00
Boxford Taper Turning Attachment	£225.00
Boxford Lathe Cabinet	£100.00
Collet Drawbar, Adaptor & Nose Cap	£85.00
Boxford Apron & Saddle Assembly with Power Crossfeed	£200.00
Boxford Saddle Limit Switch Kit	£40.00
New Brook Crompton 1 phase 240 volt electric motor	£150.00
Danfoss Contactor & Overload Switch for above	£32.00
Headstock Saddle & Apron parts available	POA
Boxford 3-2MT Headstock Sleeve	£8.00
4.1/2" or 5" Tailstock	£125.00
T-slotted cross slide, fits Models A, B, C, AUD, BUD, CUD & Southbends (New)	£90.00
Boxford Screwcutting Gearbox & Leadscrew (Metric)	£250.00
Boxford Change Gear Cover	£40.00
Boxford Change Gear Quadrant	£15.00
Boxford Topslide Assy	£45.00

MYFORD SPARES AND TOOLING

Change Gears:
20T-£4.00, 21T-£4.00, 25T-£5.00, 30T-£5.00, 35T-£5.00, 38T-£8.00, 40T-£6.00, 45T-£6.00, 50T-£7.00, 55T-£7.00, 60T-£9.00, 65T-£9.00, 70T-£9.00, 75T-£10.00, 80T-£12.00, 100T-£14.00, 127T-16.00

Myford (Toolmex) Quick Change Toolpost (4 holders) New	£125.00
Myford 7" Faceplate	£22.00
Myford 4" Backplate	£10.00
Myford Vee Block	£12.00
Myford Super 7 Half Nuts (pair)	£15.00
Myford 4.1/2" Catchplate	£15.00
Myford Lever Operated Collet Chuck & 8 Collets	£250.00
Myford 1133C 16mm Arbor	£25.00
Myford Multi Stop (for use with capstan att.)	£85.00
Myford 6 Station Capstan Att., Immaculate, fit S7 or ML7	£500.00

HARRISON SPARES AND TOOLING

L5 and L6 gears 20T, 25T,	£10.00
28T, 32T, 34T, 35T, 36T, 38T	£15.00
42T, 43T, 44T, 45T, 46T, 48T	£20.00
40T, 50T, 55T, 56T,	£25.00
60T, 63T, 64T, 65T, 66T, 69T	£30.00
70T, 72T, 75T, 76T, 77T	£35.00
80T, 81T, 84T, 86T, 90T, 94T	£40.00
100T, 100T Nylon, 108T, 115T, 120T, 120T Nylon	£45.00
125T, 130T	£50.00
127T	£60.00
9" Faceplate	£35.00
15" Faceplate	£85.00
18" Faceplate	£75.00
6" Catchplate	£20.00
5" and 6" 2.1/4"x6TPI Backplates	£15.00
6" 1 1/2" x 6 TPI Backplate	£22.00
7.1/2", 2.1/4"x6TPI Backplates	£20.00
L5/L15 micrometer carriage stop	£50.00
L15 4 position indexing carriage stop	£75.00
L5/L6 travelling steady, complete	£30.00
Saddle apron cross slide and tailstock handwheels	each £15.00
Gear charts, name plates and badges,	from £3.00
Harrison L15 traveling steady	£55.00
Harrison L5 Fixed Steady	£65.00
Harrison L5 Gap Piece	£60.00
Harrison L5 Cross-slide Nut (Imperial or Metric)	£40.00
L5 Boring Table	£125.00
L5 1.3/8" bore headstock sleeves	£20.00
L5 10" 4 jaw ind chuck (2.1/4"x6TPI)	£100.00
L5A Topslide Assembly	£75.00
L5 saddle assembly	£125.00
6" L5 backplate 1.1/2"x6TPI	£20.00
Harrison Dividing Head Division Plates,	each £15.00
Harrison M400 Capstan Attachment, unused	£500.00
Harrison M400 Saddle Drilling Attachment, unused	£150.00

COLCHESTER SPARES AND TOOLING

Colchester Triumph 2000 Fixed Steady	£175.00
Colchester Triumph 2000 Travelling Steady	£75.00
Colchester Triumph 2000 14" Faceplate	£100.00
Colchester Triumph 2000 Headstock Sleeve	£35.00
Colchester Triumph 2000 S\C Gearbox Casing + a few parts	£150.00
Colchester Bantam 2000 18" Faceplate (unused)	£100.00
Colchester Bantam/Chipmaster Tailstock	£125.00
Colchester Student 1800 Fixed Steady	£150.00
Colchester Student 1800 Roundhead Headstock Sleeve	£20.00
Colchester Student 1800 Rack (new)	£75.00
Colchester Student 1800 Screwcutting Gearbox	£225.00
Colchester Student 1800 Headstock Internal Gears	POA
Colchester Student Roundhead Gap Piece	£50.00
Colchester Student Roundhead Rack	£25.00
Colchester Student Roundhead Thread Dial Indicator	£35.00
Colchester Student Roundhead American Toolpost	£20.00
Colchester Student Roundhead Headstock sleeve	£25.00
Colchester Student Roundhead Change Gears (Various Sizes) each	£15.00
Colchester Student Roundhead Travelling Steady	£30.00
Colchester Triumph Roundhead 21" Faceplate	£100.00
Colchester Triumph Roundhead 14" Faceplate	£75.00
Colchester Triumph Roundhead 8" Catchplate	£25.00
Colchester Triumph Roundhead 12" 4 Jaw Chuck	£100.00
Colchester Triumph Roundhead Tailstock	£150.00
Colchester Mascot Roundhead 20" Faceplate	£100.00
Colchester Mascot Roundhead 12" 4 Jaw Chuck	£100.00
Colchester Mascot Roundhead 10" Catchplate	£30.00

MACHINE ACCESSORIES

OMT 16" Horizontal/Vertical Rotary table	£500.00
OMT 10" Optical Rotary Table, VGC	£200.00
OMT 12" Inclinable Rotary Table	£350.00
Marlco 8" Rotary Indexing Table	£200.00
Vertex 5" Horizontal/Vertical Rotary Table, NEW	£135.00
Elliott 15" Rotary Table	£250.00
Bessboro SWR2 325mm Swivel & Tilt Rotary Table	£350.00
Taylor Hobson Inclinable 6" Rotary Table	£225.00
Abwood 8" Swivel and Tilt Rotating Table	£250.00
Elliott U1/U2 Rack Dividing Attachment	£150.00
Apex 4" Swivel & Tilt Machine Vice (as new)	£150.00
Abwood 6" Swivel & Tilt Vice	£250.00
Spencer Franklin 150mm Power Lock S/C machine vice, vgc	£200.00
Apex 4" Universal Vice (as new)	£150.00
Marlco Indexer and 7 collets (1.3/4" Cap.)	£250.00
Carl Zeiss 130mm Optical Dividing Head and tailstock	£450.00
Thiel/Fumia Dividing Head	£300.00
Cooke Troughton and Simms Optical Inspection Dividing Head	£500.00
Hofmann 5" Dividing Head & Tailstock	£400.00
Swivel Vertical Milling Head (Large), 4MT	£150.00
Elliott Sturdimill 1250 Slotting Head	£350.00
Monks & Crane SL1 Cutter Grinding Attachment	£75.00
Thoka Arbo No.2 2MT 8 Station Turrett Drill Attachment	£250.00
30 INT Stub Arbors to Take Shell End Mills, Good Range	£30.00
Clarkson 2MT S Type Autolock Chuck, 4 Imp Collets	£100.00
Clarkson 30 INT FC3 Cutter Holder	£25.00
Osborn Titanic 3 MT Milling Chuck, 4 Imp Collets	£85.00
Osborn Titanic R8 Milling Chuck & 4 Collets	£85.00
Clarkson 30INT C Type Autolock Chuck, 4 Imp Collets	£65.00
Clarkson 30 INT Autolock Chuck (small) with 4 collets	£85.00
Clarkson 40 INT C Type Autolock Chuck (large) 2 Imp Collets	£85.00
Clarkson 40 INT Autolock Chuck (large) with 2 collets	£100.00
Clarkson 40 INT Autolock Chuck (small) with 4 collets	£80.00
Clarkson 40 INT Dedlock 200 chuck	£50.00
Clarkson 40 INT FC3 Holder	£25.00
Clarkson Large/Small Adaptor & 4 collets	£100.00
Afil 45 INT Collet Chuck(unused)4 small metric collets	£75.00
Clarkson 50 INT Autolock chuck (lge) 2 imp collets	£100.00
Clarkson 50 INT Autolock chuck (small) 4 imp collets	£85.00
Clarkson 50 INT Dedlock 200 chuck	£85.00
Clarkson 50 INT FC3 holder	£45.00
Titanic 50 INT milling chuck and 4 small collets, imp	£75.00
Bristol Erickson Acramill 50INT collet chuck - large	£125.00
Clarkson 4MT Dedlock 150 Chuck	£75.00
Osborne Titanic 4MT Chuck (lrge) 2 Imp collets	£85.00
Clarkson 4 MT Autolock chuck (lge) 2 imp collets	£80.00
Clarkson 5 MT Autolock chuck (small) 4 met. collets	£80.00
Clarkson Autolock Chuck Collets, Large	each £15.00
Clarkson Autolock Chuck Collets, Small, Imp. ..each £15.00 Metric	£20.00
Modeloy 3MT Light Duty Milling Chuck, 3 Imp Collets	£65.00
Modeloy 2 MT light duty milling chuck, 3 imp collets	£55.00
Mikron 52mm Headstock collets	each £25.00
40 INT-1, 2, 3, 4 MT adaptors	each £25.00
Toolmex 40INT 20" Milling Arbor (Boxed, Unused)	£125.00
50 INT-2, 3, 4 MT, 40INT adaptor	each £30.00
50 INT horizontal milling arbor	£50.00
R8-3MT and R8-2MT Adaptors	£22.00
Precise 60 Piece Spacing Collar Set, 1" Bore (8 Pce Missing)	£75.00
Precise 56 Piece Spacing Collar Set, 1.1/4" Bore	£125.00
Precise 60 Piece Spacing Collar Set, 1.1/4" Bore	£125.00
Lushington 40INT Boring and Facing Head	£250.00
Lushington No2 Precision Offset Boring Head, 4 MT Shank	£65.00
A B Creed 4 MT Boring Head	£150.00
A B Creed 3 MT Boring Head	£100.00
Super 40 INT Boring and Facing Head	£250.00
Garnet Boring and Facing Head, 30 INT Shank (Removable)	£250.00
Garnet Boring and Facing Head, 40 INT Shank	£250.00
J and S Hatch R8 Boring Head, Box	£125.00
Wohlhaupter UPA2 Boring and Facing Head, 2 MT Shank, Boxed	£350.00
Wohlhaupter UPA3 Boring & Facing Head, 9 B&S Shank	£375.00
Wohlhaupter UPA4 Boring & Facing Head (Fits Dixi Jig Borer)	£450.00
Wohlhaupter UPA4 Boring and Facing Head, 40 INT Shank	£575.00
Wohlhaupter UPA5 Boring & Facing Head, 5MT Shank	£600.00
UBS GR Boring and Facing Head, 4MT Shank, Boxed, Accesories, VGC	£250.00
Newall 4MT Boring & Facing Head, Very Well Equipped, VGC	£400.00
Huron Precision Boring and Offset Boring Head, 40INT, Cased	£225.00
Armag 4MT Boring & Facing Head for irregular bores	£300.00
Bridgeport No 2 Boring Head, R8 Shank	£125.00
Lockwood 2MT Micro boring head (new)	£75.00
Criterion K3, 4MT, 1" Capacity Reversible Tapping Head, VGC	£275.00
Tadco Autoguard 250 Tapping Head, 2MT	£175.00
Tadco Autoguard 75 Tapping Head, 1MT	£150.00
Marlco Adjustable Pitch Circle Drilling Fixture,	£250.00
Slack & Parr Type A38/2 3 spindle Drill Head	£200.00
Ackworthie-Goliath 4 spindle drill attachment, 1MT	£100.00
Coventry Type CH 1/2" Die Head	£75.00
Coventry Type CH 1" Die Head	£75.00
Coventry Type CH 1.1/2" Die Head	£100.00
Coventry Type CHS 1.1/2" Die Head	£150.00
Herbert Chaser Grinding Attachment, 1 1/2" Diehead Chasers	£150.00
Herbert Chaser Grinding Attachment, 1.1/4" Diehead Chasers	£125.00
Herbert Chaser Grinding Attachment, 1" Diehead Chasers	£100.00
Set of 4 Woden Straight Lathe Carriers, 1/2"-1.1/4"	£15.00
Set of 6 Jones & Shipman Straight Lathe Carriers, 1/2"-2"	£25.00
Jones & Shipman Tap Relieving & Sharpening Att., VGC	£400.00
Jones & Shipman Radius Dresser	£150.00
SMP Floating Chuck (30mm Shank)	£85.00
Pratt 12" 4 jaw chuck L2 fitting	£150.00
Toolmex 12" 3 Jaw Chuck, Backplate Mounting	£200.00
Burnerd Multisize Collet Type M2, 3, 6	each £20.00
Burnerd Multisize Collet Type MB8, 10, 11	each £25.00
Union Mafg.Co 6" Independent self centering 3 jaw chuck	£75.00
Jaws for P/B 6 Jaw Chuck, fit 250mm chuck, Pt No 2658-26884	£75.00
Burnerd 548BLK Soft Jaws (fit 10 1/2"-12" 3 jaw chuck)	£25.00
Burnerd 308BLK Soft Jaws (fit 4" 3 jaw Chuck)	£20.00
Toolmex 160mm 3 Jaw Chuck (Unused)	£125.00
SCA 250mm 3 jaw chuck, D8 camlock	£125.00
Old 3 Jaw Chuck suitable for Dividing Heads, Fixtures etc. 1 set of Jaws only 4", 5" or 6"	£25.00
7" Crawford Trugrip Collet Chuck c/w 30 collets 3/16"-2" cap	£500.00
Herbert No.4 Quick Change Drill Chuck & Holders	£100.00
Jacobs 1A 0-1/4" Drill Chuck, 1JT Mount, Boxed, unused	£12.00
Jacobs 30 0-5/16" Drill Chuck, 2JT Mount, Boxed, Unused	£12.00
Jacobs 32 0-3/8" Drill Chuck, 2JT Mount, Boxed, Unused	£12.00
Hardinge Turrett Tool Presetting Fixture	£650.00
Aciera F4 Horizontal Overarm	£200.00
Aciera F4 Differential Indexing Gearbox & Gears	£450.00
Thiel 1/2"x8" Horizontal Milling Arbor 3MT (unused)	£85.00
Thiel 5/8"x8" Horizontal Milling Arbor 3MT (unused)	£70.00
Thiel 3/4"x10" Horizontal Milling Arbor 3MT (unused)	£75.00
Thiel 3/4"x8" Horizontal Milling Arbor, Thiel Taper (Unused)	£85.00
Thiel Collets (11 Assorted) Large Thiel Taper	£200.00
Thiel Stub Arbor 1/2" or 5/8" (unused)	£35.00
Thiel Collets (small) Various sizes	each £15.00
Smart and Brown Step and Ring Collets(Models A & M)	each £25.00
Disc Chucks for Boley Lathe, 15mm Dia. Shank	each £25.00
Schaublin 102 Screwcutting Attachment (unused)	£750.00
8 x Schaublin F16 Collets	£75.00
8 x Schaublin F20 Collets	£85.00
6 x Schaublin F22 Collets	£75.00
Schaublin W20, W25 Collets	each £10.00, £12.00
Pultra 8mm Collets 3 for	£25 each £10.00
Pultra 8mm Disc Collets	each £15.00
Pultra 10mm Collets	each £15.00
Pultra Vertical Slide	£160.00
5C Disc Collets (various diameters)	each £15.00
1MT, 2MT, or 3MT tailstock die holder (new)	£30.00
3 MT horizontal milling arbor (new)	£75.00
3-2 MT open ended ejecting adaptor (new)	£15.00
3 MT stub arbor (new)	£30.00
40INT Stub Arbor (1.1/2" dia), unused	£35.00
3-4MT Extension Sleeve	£25.00
4-6MT Extension Sleeve	£50.00
Jones & Shipman 6MT Rotating Tube Centre	£100.00
1MT, 2MT or 3MT revolving centre (new)	£20.00
Mandrin Universal Floating Reamer Holder, 4MT Shank, 2MT socket	£95.00
4MT lathe centre (unused)	£9.00
5MT lathe centre (unused)	£10.00
6MT Fixed Centre (Unused)	£25.00
Viceroy 5" Catchplate	£15.00
Viceroy Change Gears, Various sizes available	POA
Viceroy Topslide	£65.00
Raglan Gears, 32T-£10, 38T-£10, 42T-£12, 44T-£12, 45T-£12, 48T-£12, 52T-£14, 60T-£14	
Raglan 6" 4 Jaw Chuck	£100.00
Raglan Lever Operated Cut off Slide	£150.00
Raglan 8" Backplate	£22.00
Southbend Tailstock	£75.00
Dividing Head Tailstocks, 5" & 7" available	each £30.00
Tailstock for Marlco Indexing Fixture 5" C/H	£150.00
J & S Type 2241 104 Double Ended Boring Bar	£15.00
Lushington LBK-161 3/8"-1" Cap. Capstan Knurling Tool 1.1/2" Shank	£150.00
Miller Type STRO, 1" Shank Quick Knurl	£125.00
Miller Type STPR1, 2 MT Shank Quick Knurl	£125.00
Two Wheel Clamp Type knurling Tool (Marlco Type) NEW	£45.00
Tripan Size 111 Quick Change Toolpost and 6 Holders	£200.00
Burnerd TP2 Patent Toolpost set	£125.00
Deckel 40INT Horizontal Arbor	£75.00
R8 Horizontal Arbor, 1"	£80.00
Quantity of 2" Arbor Spacers	£30.00
Taylor Hobson Engraver Type Tables	each £85.00
Jones & Shipman Dial Type 2100 Grinding Wheel Balancer	£250.00
Qty. of Tooling for Ward Tool & Cutter Grinder	£350.00
Copies of Machine Manuals, Many Available	S A E For List

WORKSHOP EQUIPMENT

Harvey Frost Garage Wheeled Gantry, 10' High, 1 Ton Cap	£250.00
Omega 12 Ton Bench Garage Type Press, as new	£250.00
Large Quantity of Laboratory Glassware, inc Measuring Cylinders Beakers, Test Tubes, Flasks, Stoppered Bottles etc, New, Unused	SAE For List
3' x 2' Surface Table	£250.00
12" x 8" or 10" x 8" Surface Plate	£40.00
12" x 12" Surface Plate	£45.00
18" x 18" Surface Plate	£65.00
24" x 17" Black Granite Surface Plate	£150.00
Crown Windley 9" x 7" Black Granite Surface Plate, VGC	£75.00
Crown Composine 6"x12" T-slotted Compound Sine Table	£325.00
Jones and Shipman 12" x 12" Co-ordinate Table, VGC	£300.00
P.V.E. No.2 Co-ordinate Table 12" x 13"	£350.00
5" x 5 1/4" Micrometer Adjustable Co-Ordinate Table	£150.00
Pair Windley Bros 15" x 18" x 24" Hand Scraped box Cubes	£300.00
9"x7"x6" T-slotted Box Cube	£85.00
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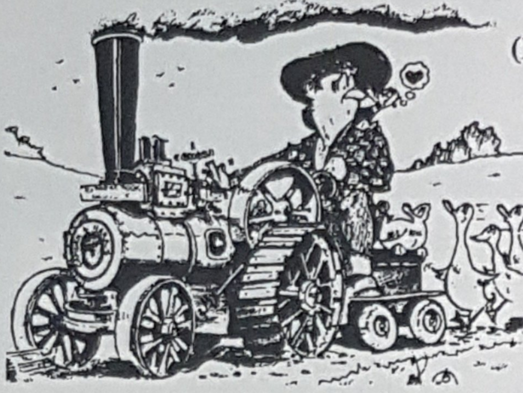

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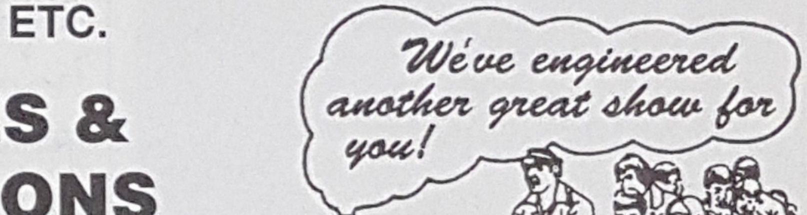
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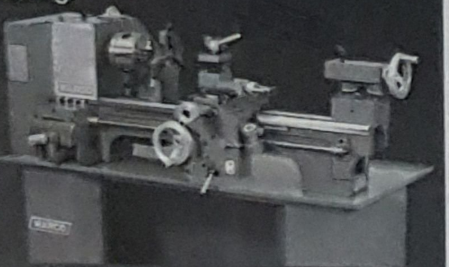

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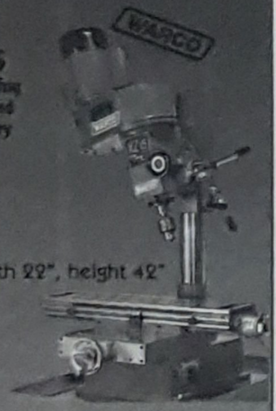

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ENGINEERING in MINIATURE

VOLUME 19

A tee Publication

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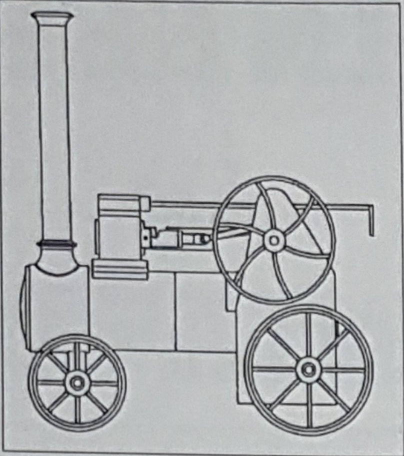
EDITORIAL

'DRAYTON' – A PORTABLE ENGINE

Following on from the successful launch of their model steam lorry, 'Penrhyn', Winson Engineering recently announced the arrival of their latest design, a portable steam engine, 'Drayton'.

Based on typical designs of the agricultural power plants seen all over the rural areas of Britain during the early 1900s, the portable steam engine has been designed to provide a very reasonably priced model which is easy to construct and simple to operate. As with its forerunners, 'Polly' and 'Penrhyn', all parts are available in fully machined form allowing it to be built without the need for any machinery. Designed on CAD with most parts manufactured on modern CNC machines, the emphasis is on producing parts with superb accuracy for ease of assembly.

Supplied with a fully silver soldered copper boiler, the total cost for all components required to make this substantial, fully operational live steam model is just £1,365.00 plus VAT. As with all Winson models, all components can be purchased individually at no extra charge. Further information is available from Winson Engineering Ltd, 3-4 Griffin Industrial Estate, Penrhyndeudraeth, Gwynedd LL48 6LE, telephone 01766 771071 or fax 01766 770028.



THE INDUSTRIAL LOCOMOTIVE SOCIETY

We have just received the latest edition of the *Industrial Steam Locomotive*, the journal of the Industrial Locomotive Society. A very nicely produced A5 size magazine, it contains some fascinating photographs of long scrapped standard and narrow gauge industrial locomotives and the magazine makes for very interesting reading. There is a lot of interest in the model engineering world with industrial locomotives and if anyone is looking for a prototype or more information on a locomotive they have decided on, then the Industrial Locomotive Society is the organisation to contact. Anyone requiring further information should contact the membership secretary, John Hill, 'Byfield', Wrefords Lane, Exeter EX4 5BR. John, incidentally, has just completed a 5" gauge model of a 2ft gauge Peckett – a locomotive design that is not often modelled.

NEW RAILWAY UNDER CONSTRUCTION

A completely new 7¼" gauge railway is under construction in Pugneys Country Park, Wakefield, West Yorkshire. The 1,000 metre line will be laid along the south eastern side of the park, linking the entrance car park/changing room area with the Nature Reserve. A class 91 locomotive pulling sit-in coaching stock and a newly built four car tram unit, modelled on a Manchester tram, will provide power. As the line develops, it is hoped that later additions will include steam working using a Lynton and Barnstaple 2-6-2 locomotive as well as a Eurostar train set. The full development will take about four years, but the builders had a restricted service operating by the end of September, using the Manchester tram set.

Pugneys Country Park is in Denby Dale Road, Wakefield, West Yorkshire and anyone wishing to find out more about the new railway should phone 01924 264385. It is intended that the line will be open weekends throughout the winter, weather permitting.

BINDING VOLUME 18 OF *ENGINEERING IN MINIATURE*

As is our usual practice, we have again been able to arrange for the bulk binding of readers' copies of *Engineering in Miniature*. These bindings will be to the same standards as the previous volumes with the same quality cloth and blocking. The cost of this binding is £12.50.

If you wish to have your volume bound, the procedure is as follows:

1. First check very carefully that your magazines are suitable for binding; that is to say they should not be damaged in any way since even creased corners will result in the binding machinery rejecting them. Replacement copies of the magazine are available should you have any copies which are not of an acceptable standard for binding and these can be obtained from our back issues department. The magazine will be bound in the traditional manner and therefore the condition of the cover and advertising pages is not important – you need only concern yourself with checking the actual text pages. If you wish to detach the front cover and advertisements, this should be done with great care and the wire staples left in place. Having done this, please then mark the code number, which you will receive from us, in pencil on the top right hand corner of the beginning of the text pages of each issue. This will enable us to identify your particular volume when it is bound.

2. Having checked that your magazines are suitable for binding, please write to us at this office stating that you require your magazines to be bound, enclosing a cheque, postal order or money order for £15.65 (£12.50 for the actual binding and £3.15 for postage and packing).

3. Upon receipt of your instructions we will issue an official order to the binder and send you a copy of this order, together with your receipt, order number and mailing label, thus enabling you to send your magazines direct to the binder. We must stress that great care should be taken to avoid damage in the post. The packing should involve wrapping first in newspaper, then placing your issues in a cardboard carton, the corners of which should be strong enough to prevent damage to the edges of the magazine.

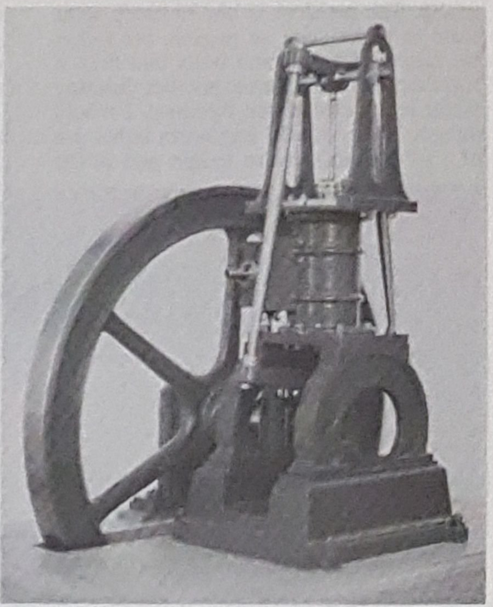
4. Since the binding process is mechanical, all the volumes must be bound at one time and a strict time limit for the receipt of all magazines must regrettably be imposed. If you require your volumes to be bound, we must ask that you place your order with us as soon as possible. Upon receipt of our mailing instructions, you must ensure that your volume reaches the binding company during the month of August; that is to say orders for binding, accompanied by your remittance, must be received in ou office between the publication of this issue and about 17th August at the very latest; and that volumes should be despatched on our instructions to arrive at the binders not later than 26th August 1997. When all of the volumes have been received by the company, production will then commence and you will receive your complete bound volume not later than mid November. We regret imposing this very tight time schedule, but this does enable us to negotiate a very competitive binding price from which you benefit.

5. We regret that it is not possible to undertake the binding of the volumes to include either covers or advertisements. We can however accept readers' earlier magazines which were not bound previously and these can now be bond along with the current volume. The price for binding earlier volumes is exactly the same as for Volume 18, i.e. £15.65 including postage and packing. If you require your earlier volumes to be bound, please telephone our office to make the necessary arrangements.

6. Finally, it should be noted that the postage charge made is merely for carriage from the binders to our office and then on direct to you the reader. It does mean that you yourself will have to pay the postage to the binders and for this reason it will be less expensive if you remove the covers and advertisements yourself prior to despatch. Do not, however, be sparing with the packing.

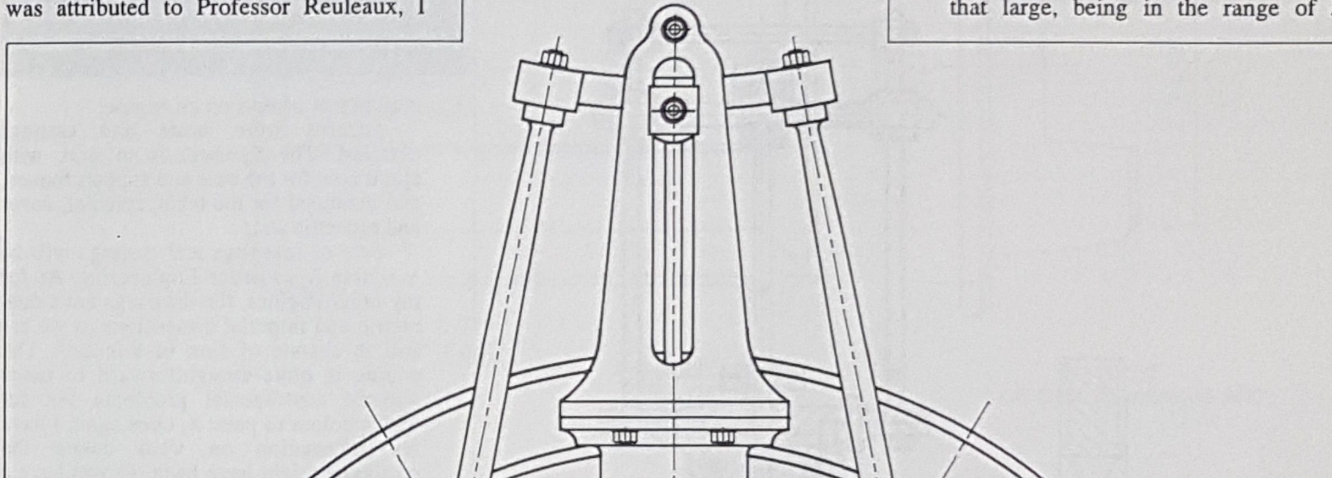
REULEAUX'S TRAPEZIUM CONNECTING ROD ENGINE

Model designed and described by Anthony Mount



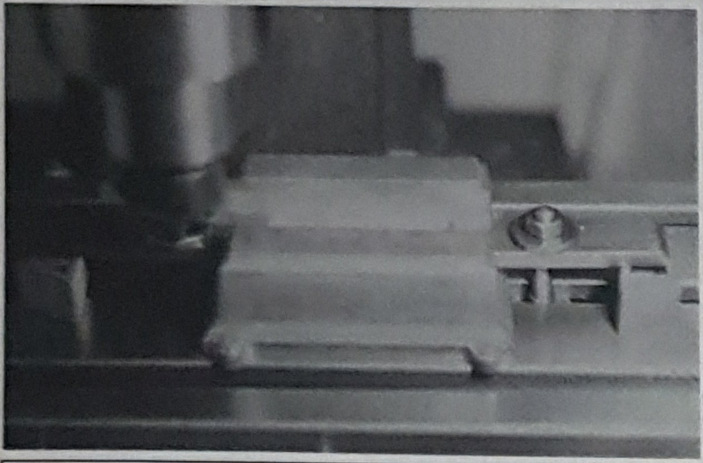
A friend of mine came across a Dutch text book which was published in 1889 and amongst the engines illustrated was a trapezium connecting rod engine. Fortunately another friend of mine lives in Holland and he was able to translate the text relating to this engine. The engine was attributed to Professor Reuleaux, I presume of diagram fame. I liked the way the engine sat there, four square and solid, the details were attractive and the model looks great when in motion.

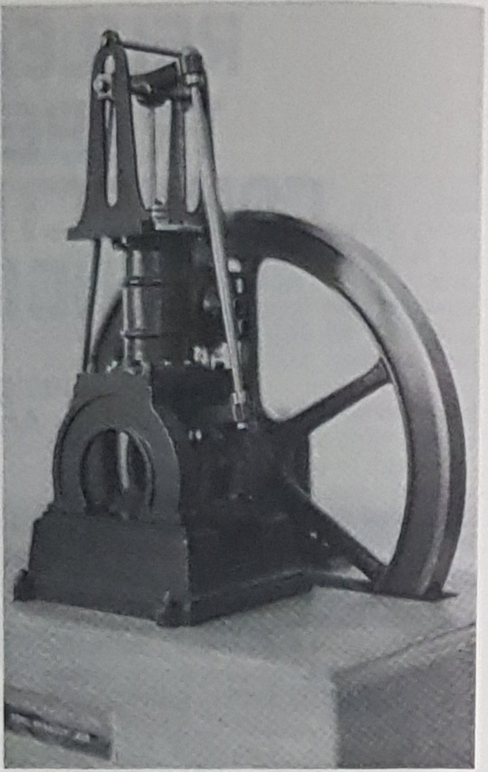
I do not know what size the original engine was, but I presume it was not all that large, being in the range of 5 to



GENERAL ARRANGEMENT – FRONT VIEW

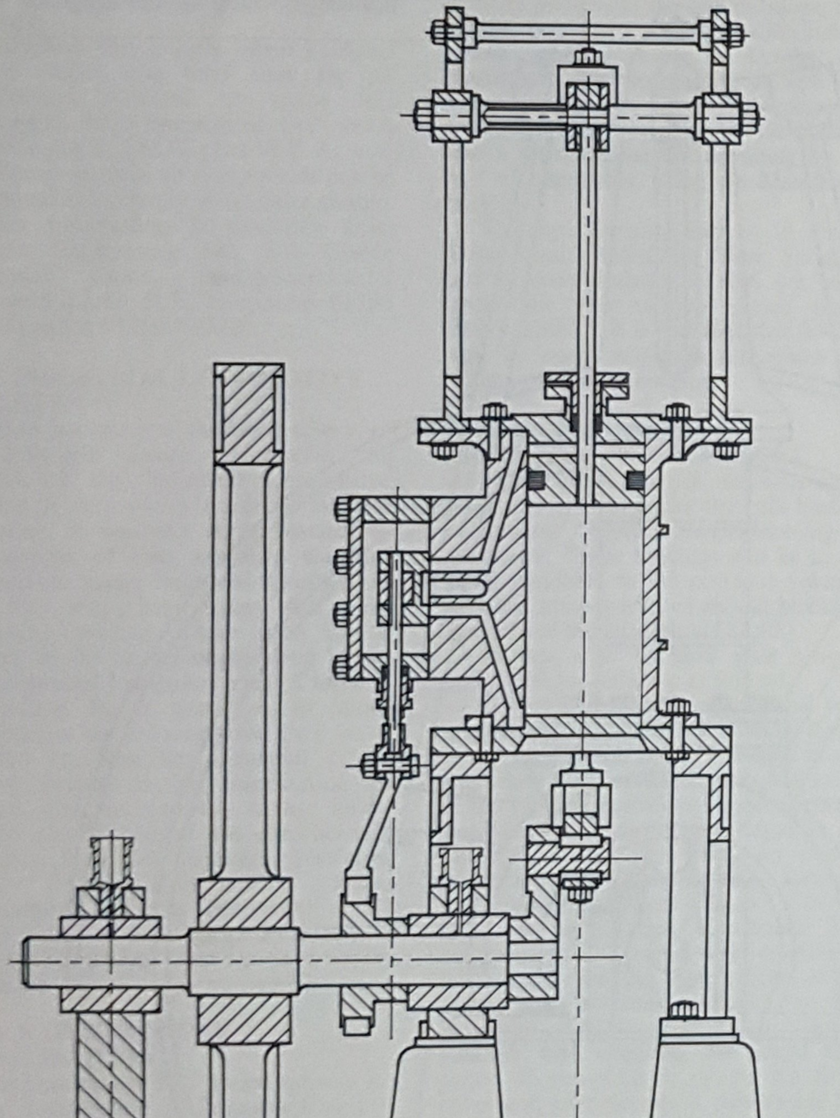
25nhp. The problem is not so much what scale to make such an engine, but rather the size of the nuts and bolts that hold it together; and of course another limiting factor is the size of the flywheel. I would imagine many model engineers lathes are of 3½" (88mm) centre height and in the case of the Myford Series 7 lathes with a gap that will take 10" (250mm) diameter. I therefore decided on a 9" (228mm) diameter flywheel which gives a bit of clearance and at this size many of the nuts work out at 8BA which is about as small as I like to go with the majority of screws on an engine.





Right: A view of the opposite side of the completed engine.

Left: Milling the bottom seating in the base casting.



GENERAL ARRANGEMENT – SECTIONAL SIDE VIEW

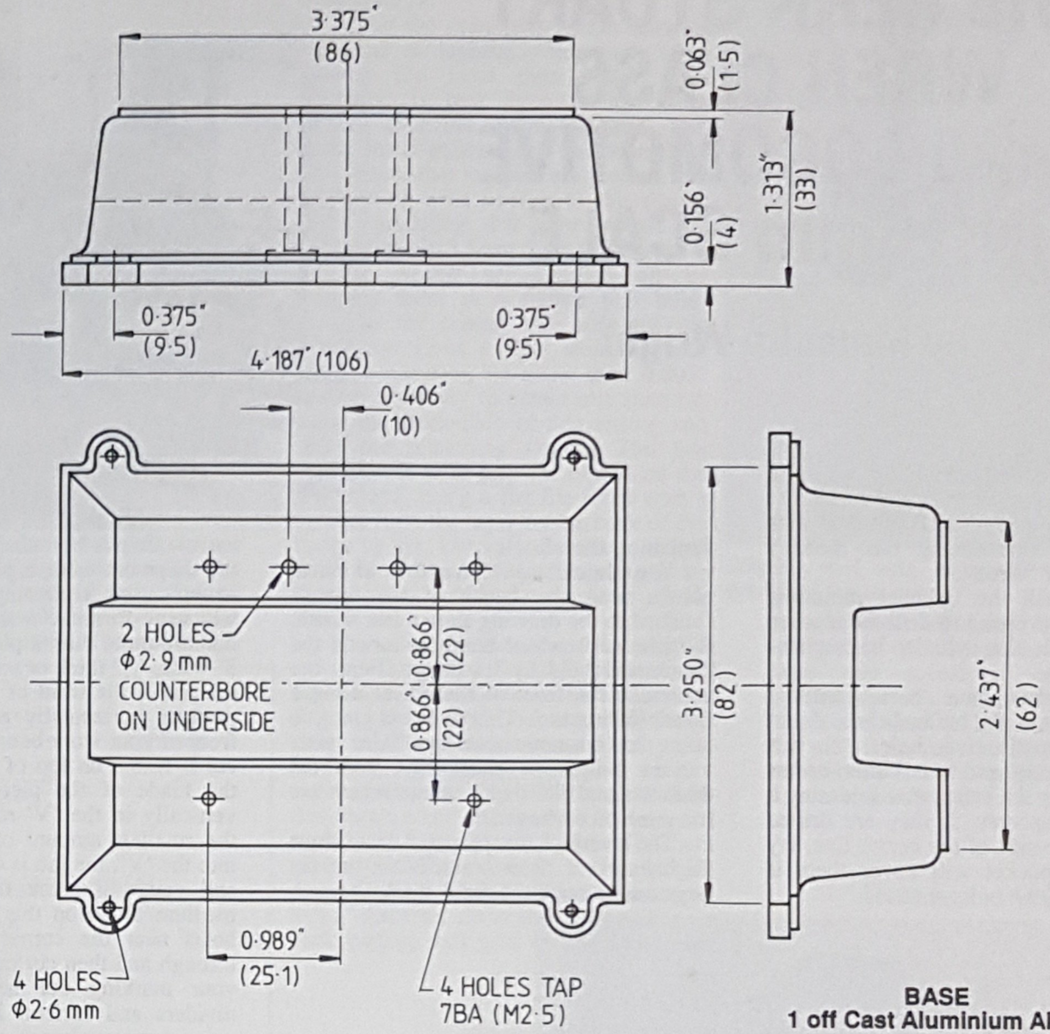
Patterns were made and castings obtained. The flywheel is in iron, with aluminium for the base and support frames, and gunmetal for the table, cylinder, cover and eccentric strap.

Sets of drawings and castings will be available from Bruce Engineering. As for my other engines, the drawings have dual metric and imperial dimensions as we are still in a state of flux in this area. The engine is quite straightforward to make without any special problems. As for which colour to paint it, once again I have no information on what colour the prototype might have been, so you have a free choice.

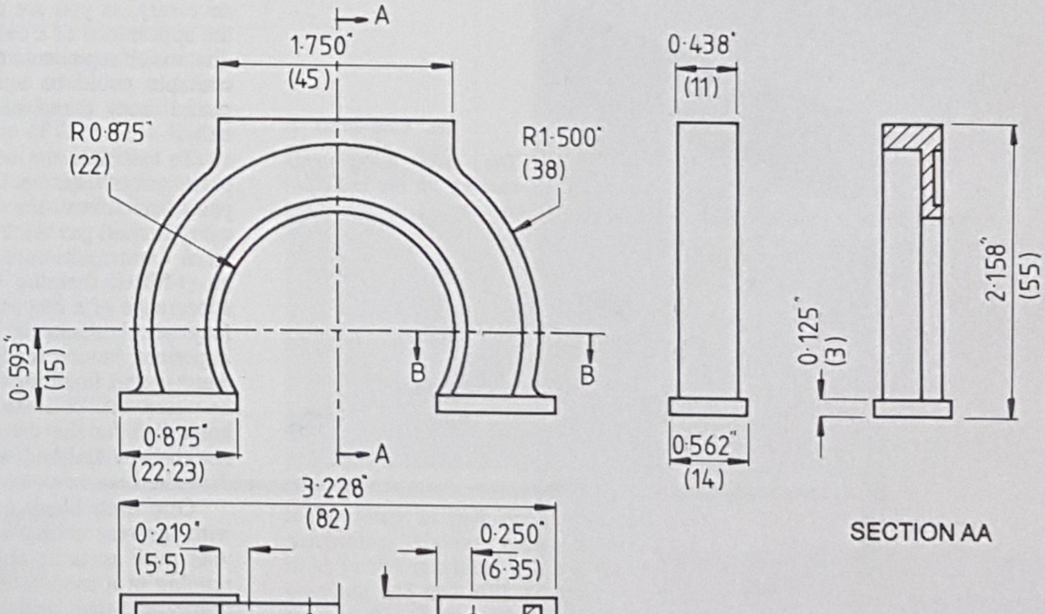
It seems practical to start construction of the model at the bottom and work upwards and so the first component to tackle is the base.

The base is an aluminium casting and it is solid rather than being cored. The original would have been hollow of course and you would think that we should follow suit, but surprisingly, such a casting can be made cheaper in the solid rather than hollow, so that's how it goes. Remove any flash and high spots, clamp in the machine vice and, with a largish end mill, skim the bottom to give a flat surface. Alternatively the surface can be flycut. Reverse and hold down to the milling machine table, with clamps in the centre recess, to machine the top flat. Mark out and drill and tap for the bolt and stud holes. Finish up by cleaning up all over leaving a good finish for the paint. Aluminium castings come in many grades, some machining better than others. My castings are in LM4 which is not too difficult to machine especially when some cutting oil is applied. When tapping, the use of cutting oil is again recommenced. If only our light alloy castings were in Dural, that's a metal I do enjoy machining.

Continued on page 7

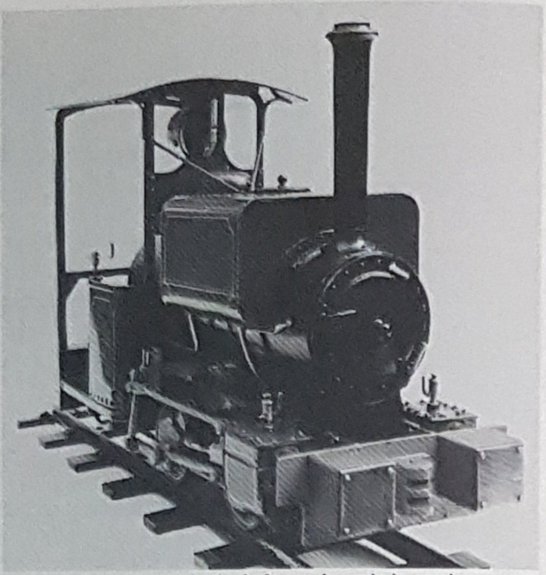


BASE
1 off Cast Aluminium Alloy



SUPPORT FRAME
2 off Cast Aluminium Alloy

THE KERR STUART WREN CLASS 0-4-0 LOCOMOTIVE IN 16mm SCALE



by Malcolm Wright

Part Seven

One or two problems have cropped up in the last few articles – for which I sincerely apologise – so I will deal with them before commencing this month's construction of 'Wren'.

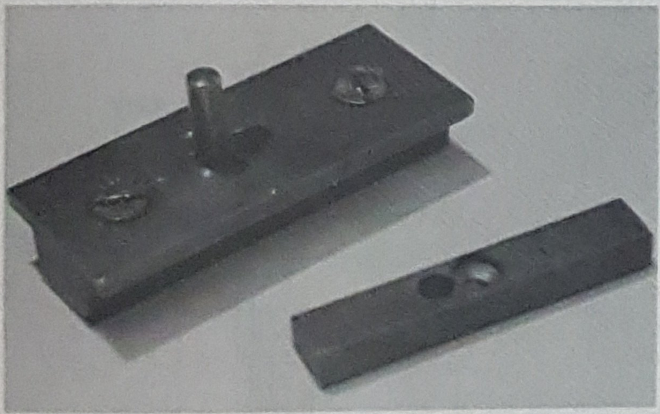
Do not drill the cylinder mounting holes – it is far easier to drill them when you have made the cylinder back plates later on.

Some readers have been confused about the holes in the buffer beams. Apart from the cosmetic rivet holes, the two holes in the front and rear buffer beams are for securing the beam after soldering it to the frame spacers. If they are drilled 5mm on either side of the centre line, my cast coupler pocket will cover them if countersunk 10BA bolts are used.

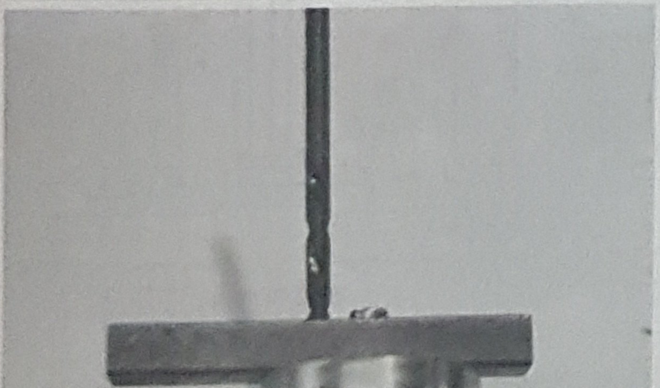
Finishing the wheels

You should now have four identical blanks with the backs of the wheels finished to the drawing shown last month. Reverse each wheel blank in turn in the chuck and hold by its flange. Form the recess on the front of the wheel using a boring/facing tool. This recess is going to take the cosmetic overlays. Use your vernier caliper to check that both the diameter and the depth of the recess are the same on each wheel.

The overlays are prepared from three thicknesses of sheet brass. Mark out the large insert on the 1.5mm thick sheet. A narrow strip is best since it is easier to cut the shape out using a piercing saw. If you haven't used a piercing saw before, you will need to make a sawbench, which is nothing more than a piece of wood about 3" wide, $^1/_2$" thick or so, with a 'V' recess cut out of the front of it. The saw bench projects horizontally about 3" from the front of your work bench. The metal to be cut is rested on top of the sawbench and the blade of the piercing saw is used vertically in the 'V' recess. In this way, the smallest amount of metal overhangs into the 'V', the job is easy to hold firmly and you will break few blades. Use a medium blade on this thick metal. Drill holes near the corners, feed the blade through and then cut out the overlays. Do your marking out heavily with sharp dividers and scriber. Finish the job by using your sawbench again and filing to the lines using the file vertically, as a jeweller would. Extreme accuracy is not necessary, as you are trying to reproduce the appearance of a cast wheel. The small disc which represents the boss around the crankpin could be a thin disc of metal parted from a rod of mild steel in the lathe.



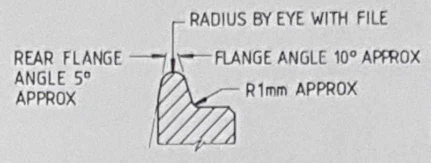
The two components making up the crankpin drilling jig.



This photograph illustrates how the wheel is placed between the two parts of the crankpin drilling jig. The drill is placed ready for producing the crankpin hole.

To assemble the wheels, clean all the parts, cover their back faces with solder paint and sweat the assembly together using a small gas torch. You might feed in some extra multi-core solder to generate nice fillets, helping to reproduce the appearance of a cast wheel. Making these four wheel blanks is laborious and it is important, having made them, not to ruin them in the finishing. The last operation on these blanks is to drill for the axle holes and for the crankpins. The wheels can then be finished with a light skim in the lathe.

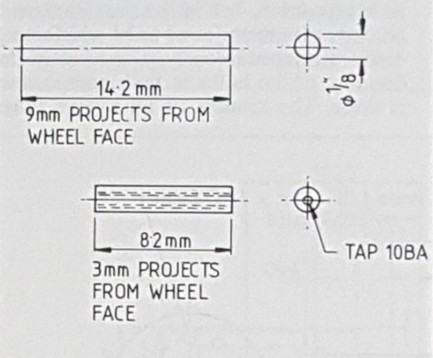
Grip each blank in turn by the tread with the rear of the wheel facing out of your most accurate chuck. With the lathe running at a moderate speed, centre drill deeply and then drill through with a drill of 0.005" diameter smaller than your axle diameter. I used $^3/_{16}$" diameter axles, so this means the drill will be number 13 or 14. Replace the drill with a $^3/_{16}$" diameter reamer and, with the lathe running very slowly, or even turned over by hand, slide the tailstock forwards and backwards to ream the hole to its finished diameter. I



WHEEL TREAD & FLANGE DETAIL

suggest that you practise this operation on a piece of waste material first – it will allow you to check that your reamer gives a good tight sliding fit on the axle material. If it does not, then see my previous article on how to make a simple reamer. We are going to secure the wheels to the axles with Loctite and pinning, so the hole in the wheel must not be too much oversize.

It is important that the crankpins are placed on the wheel face identically. The engine will never run if the crankpin throws differ. A jig will have to be made. The jig is simply a strip of metal with a piece of axle material mounted vertically in it. The wheel slips over this and then another piece of metal with an axle hole in it is placed on top of the wheel. In this second piece of metal is a hole that guides the drill which is going to form the crankpin hole. In the back of this piece of metal is a recess which engages with the crankpin boss. The photograph I hope makes the design of this tool clear. My jig is designed to be gripped in a vice on the milling machine to ensure that everything is vertical.

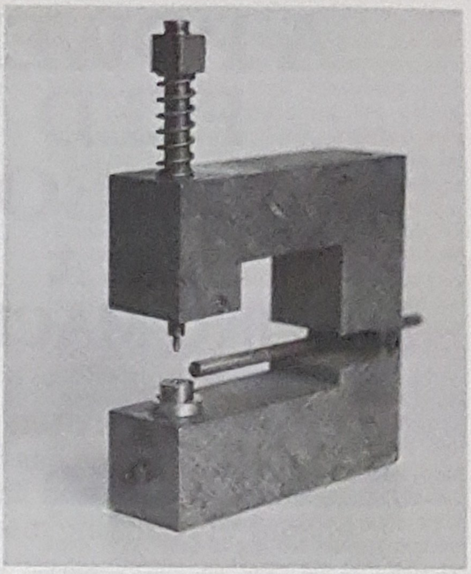


CRANKPINS
2 off each Silver Steel

The crankpin holes are going to be drilled number 31 and then hand reamed $^{1}/_{8}$" diameter. Turn the reamer so that the end is only just through the crankpin hole so that the crankpins themselves are a light press fit.

Make the crankpins to the drawing and use a tapping compound when tapping the front pins 10BA. This operation is best done in the lathe, turning over the chuck by hand. Two easily made collars 3mm and 9mm long will ensure that the pins are pressed into the wheels with Loctite to the correct depth, assuming that your wheels are approximately 5.5mm thick at the boss.

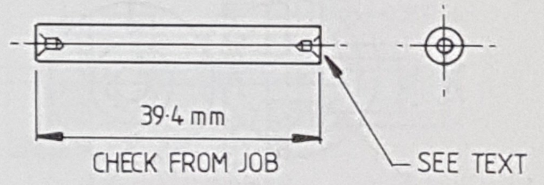
The wheels are finished off by gripping them in a fixture that holds them by the central axle hole and the treads are given a light skim. If your lathe is accurate, no more than 0.005" will be necessary to obtain true running. Lock the cross-slide at this setting and skim the remaining wheels. The last operation is to re-grip the blanks on the fixture and, using a flat file fitted with a handle, form the taper on the back of the flange by eye. Use a smaller file to radius the front and back of the flange, again by eye. Do not reduce the diameter of the flange.



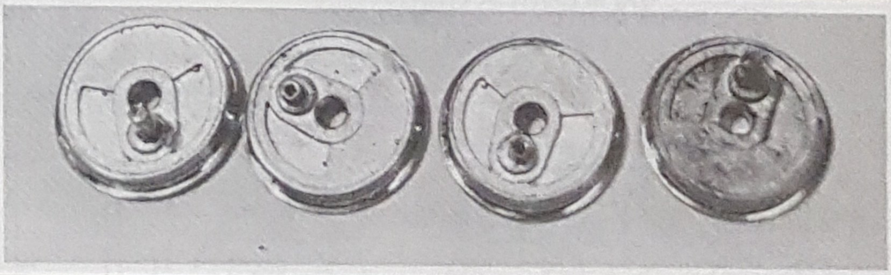
Riveting tool with adjustable depth stop as described last month.

The axles can now be produced since we now know the finished thickness of the wheels. The back to back distance, that is the distance between the flange rims, is 28mm (some modellers prefer 28.5mm). Both these distances operate satisfactorily on Peco SM32 track. Take this distance and add to it the thickness of a pair of wheels plus 0.25mm. This will give you the overall axle length, approximately 39.4mm. The axle material is $^{3}/_{16}$" diameter silver steel. If you have a back parting tool post on the lathe, this material parts off easily with a thin tool and plenty of lubrication. If you do not have this accessory, cut the axles overlength with a hacksaw, grip in the chuck and face to length. Before taking the axle from the chuck, centre drill the axle ends with the pilot part of a $^{1}/_{8}$" diameter centre drill.

To be continued.



AXLE
2 off Silver Steel (ø $^{3}/_{16}$")



A completed set of wheels with crankpins fitted.

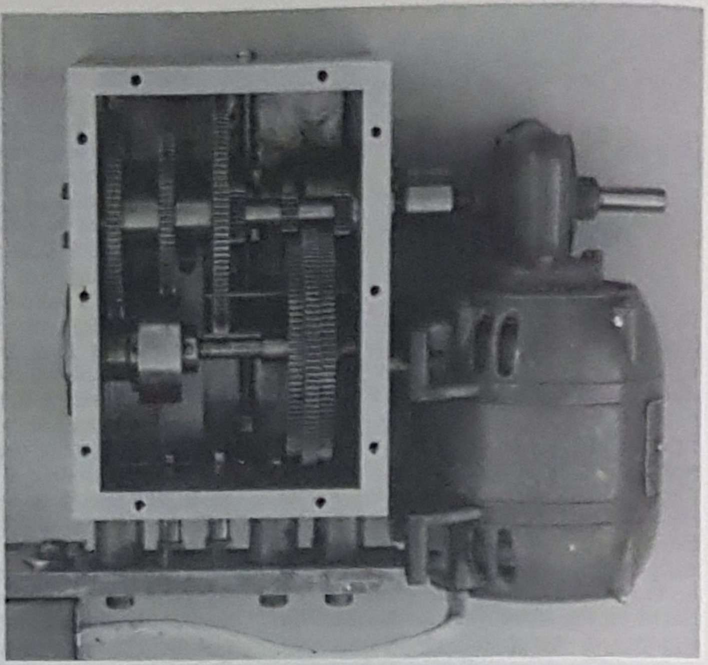
REULEAUX'S TRAPEZIUM CONNECTING ROD ENGINE

Continued from page 5

The support frames are rather attractive pieces, again aluminium castings. They are cast in one piece and will need to be sawn in half before we can start machining. Having removed the flash, hold in the machine vice on the milling machine and end mill the bottom seating flat. In the photograph you will notice a piece of metal with a hole in it. This was removed before machining commenced, but I left it in the photograph as it shows how the use of a parallel between vice top and underside of the casting foot automatically brings the foot to an equal thickness along its length. Reverse and machine the top flat. You will need packing on both sides to clear the foot. Drill the bolt holes and clean up. Obviously both frames need to be the same height. I was not too happy with the finish on the shallow recesses, and unfortunately they are on the side that is seen. I ended up turning a thick plug that fitted inside the casting, with a flat cut in the plug to clear the straight foot. The whole assembly was bolted down to the rotary table and, with an end mill, I cleaned up the recess.

To be continued.

A POWER FEED GEARBOX FOR A MILLING MACHINE



D A G Brown

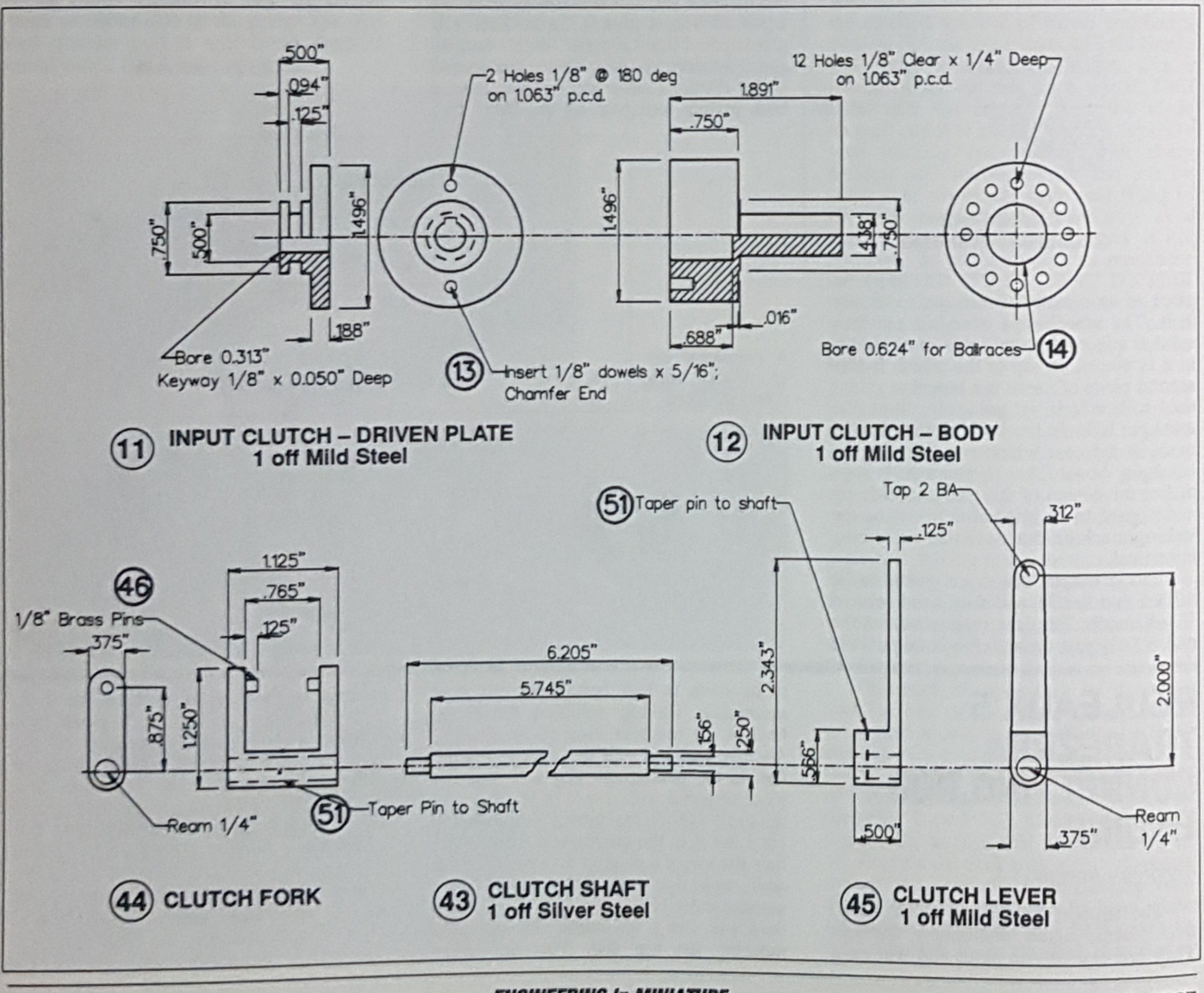
discusses the clutches for the gearbox he made and fitted to his Myford VMC milling machine

Part Five

The two clutches in this gearbox perform completely different functions. The first clutch disengages the drive to allow the motor to run without driving the feedscrew, while the second is an overload clutch in the output shaft.

INPUT DOG CLUTCH

The main body of the input clutch 12 is drawn as 1.891" overall length. This allows enough material on the end to mate with a simple cylindrical coupling to the motor unit, but the suitability of this item should be checked before it has been made and is too late. The ring of twelve holes really needs to clear the dowels 13 in any position, but in the unit illustrated No. 30 holes were found to be satisfactory – this all depends on how accurately the dividing of the holes in both components is done. The mouths of all twelve holes



⑪ **INPUT CLUTCH – DRIVEN PLATE**
1 off Mild Steel

⑫ **INPUT CLUTCH – BODY**
1 off Mild Steel

㊹ **CLUTCH FORK**

㊸ **CLUTCH SHAFT**
1 off Silver Steel

㊺ **CLUTCH LEVER**
1 off Mild Steel

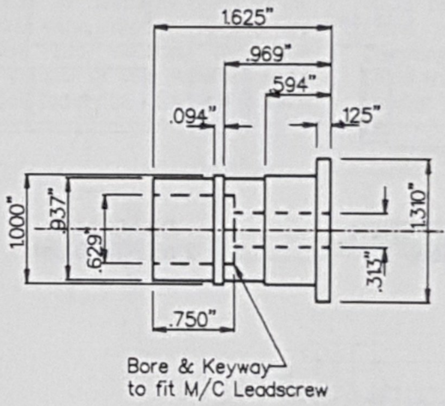
should be slightly countersunk to aid engagement of the pins. The bore of 5/8" is a tight fit on the two ballraces 14 which are pressed permanently into place, the first being pressed up to the end of the counterbore and the second one just flush with the left hand face. Before fitting the ballraces, relieve the bottom of the counterbore so that only the outer race touches the bottom surface. This arrangement of two races with a space between them is designed to provide firm support for the input shaft 9, which will already have been made (as described in part 4 of this series). The left half of the clutch 11 should slide easily on its shaft, constrained by its Woodruff key 15. Now is the time to check that the dowels 13 for the clutch fit without hindrance in any of the holes.

The clutch is operated by a lever 45 behind the front of the box, which operates a fork 44 that sits astride the input clutch unit 11. The groove in this unit must allow the brass pins 46 to slip easily between its flanks. The clutch shaft 43 is located between two of the blind bushes 56 with a nominal 0.005" end float. To fit the two taper pins 51, proceed as follows: assemble the clutch shaft in place in the box, then put the input shaft in place, locating the brass pins in their groove. Fit a clamp to locate the clutch fork 44 endwise; then strip down and fit the latter with its taper pin 51, at a slight angle to the vertical axis of the clutch fork to make it possible to withdraw it. With the fork in place on the shaft and the clutch in the engaged position, the clutch lever 45 can now be held in the right hand position by a 2BA bolt through the front plate 3, with a 1/32" washer between lever and plate. The second taper pin 51 can now be fitted. Check that the clutch disengages when the lever is moved to the left.

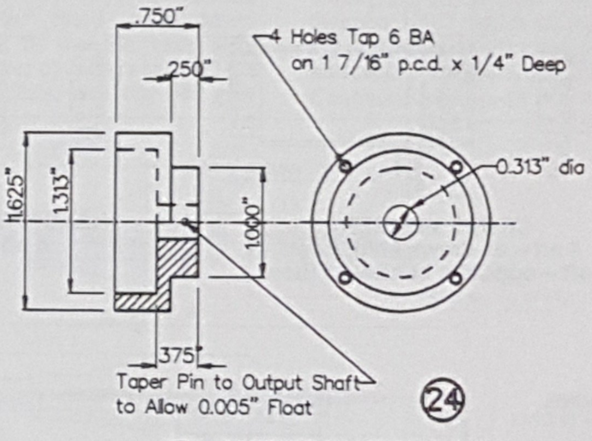
OUTPUT CLUTCH

This is provided to guard against possible destruction caused by unforeseen clashes of items on the machine table and the end travel of the leadscrew. If set up correctly, this clutch can safely be relied on to stop the table at the end of a cut using the table stop on the machine provided by the manufacturer. The output coupling 25 is bored to mate with the leadscrew of the milling machine and should be fitted with the appropriate keyway. To cut a blind keyway, it is necessary first to bore an annular groove at the far end of the blind bore to enable the slotting tool to finish its cut freely. An internal threading tool is useful for such an operation. The clutch body 20 and the cover plate 21 must be concentrically bolted together by the remaining four 6BA screws 26, entrapping the output coupling 25 between them, together with the three rings 22 and 23. All must be free to turn on the output shaft 18, which is long enough to enter and support the coupling 25. The order of assembly is shown in the exploded view of the clutch, from which it will be deduced that the two brass rings are designed to slip against the steel surfaces. Before assembly, liberally coat all of the surfaces with anti-scuffing paste and grease. The four 6BA grubscrews 27 are adjusted so that the clutch slips with a low torque. It is interesting to relate that the original clutch unit has recently been adjusted for the first time since new. It was getting a little feeble! Note that these four screws need very little tightening to get the correct release value. Finally, the taper pin can best be fitted with the output cluster 19 removed to allow about 0.005" end float on the shaft.

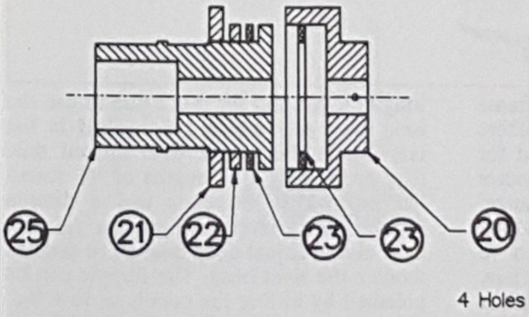
To be continued.



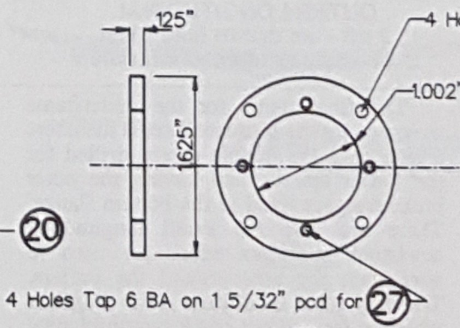
㉕ **OUTPUT COUPLING**
1 off Mild Steel


.750"
.250"
1.625"
1.313"
1.000"
.375"
Taper Pin to Output Shaft to Allow 0.005" Float
4 Holes Tap 6 BA on 1 7/16" p.c.d. x 1/4" Deep
0.313" dia
㉔

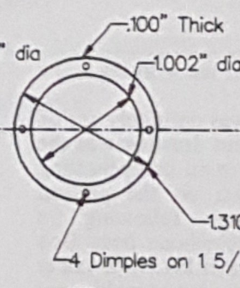
⑳ **OUTPUT CLUTCH BODY**
1 off Mild Steel



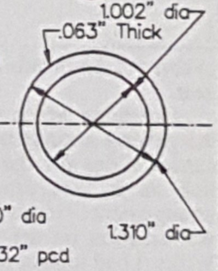
OUTPUT CLUTCH ARRANGEMENT


.125"
1.625"
4 Holes 6 BA Clr on 1 7/16" pcd for ㉖
1.002" dia
4 Holes Tap 6 BA on 1 5/32" pcd for ㉗

㉑
CLUTCH COVER PLATE
1 off Mild Steel



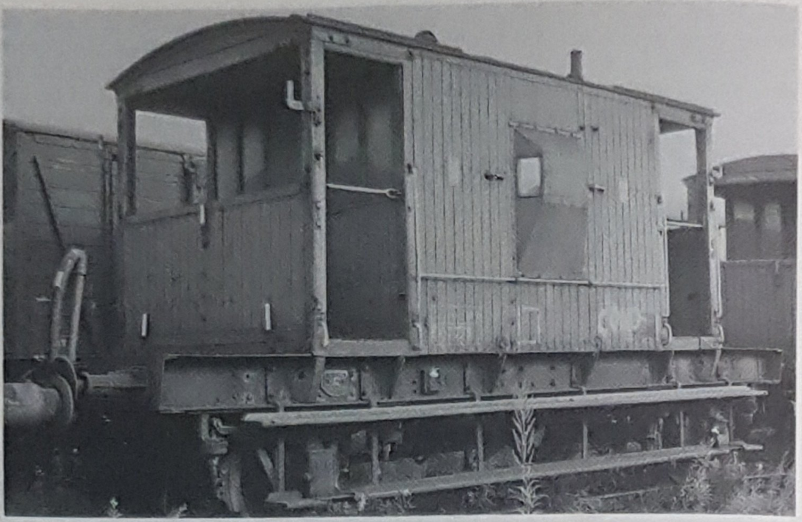
㉒
PRESSURE RING
1 off Mild Steel



㉓
FRICTION RING
2 off Brass

LNER 20 TON BRAKE VAN

Doug Hewson

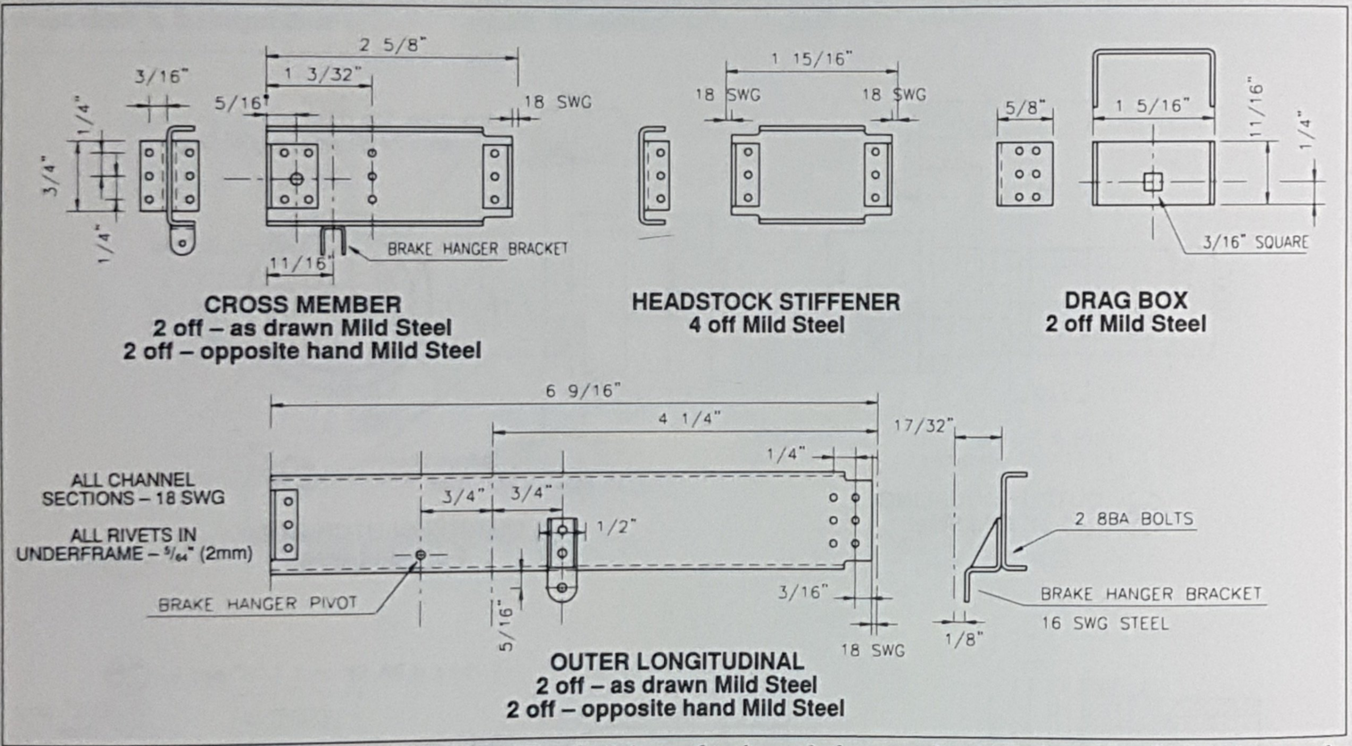


Part Three

To complete the underframe members, there are the outer longitudinals to make which require drilling for the brake hangers and these also include a little fabricated brake hanger bracket. There may also be some additional holes to be drilled in these members once I have had time to set out the brake gear properly. The brake gear on the general arrangement drawing was purposely left rather vague because, at the time, I did not have the complete details of the working system. Since then I have been grovelling about underneath a BR 20 ton brake van to sort out the details of the working brake gear.

One thing which was definitely not on the general arrangement drawing was the carrier slides for the main compensating link as it was drawn on the general arrangement drawing following a conversation on the telephone from Bob Willis. I had looked under his brake van at Gilling last August but could not remember the exact detail and layout. I now have all the details for the brake gear on the BR van and I trust that this was copied from the LNER version which I have not yet had time to seek out and study. I do know that there are LNER vans preserved on both the North York Moors Railway and the Great Central, but it is just a question of finding time to get there.

What I will do is try to ensure that any fixings are into the bottom flanges of the main members and therefore the underframe can be assembled without having to drill these beforehand, but I would really recommend that you delay any assembly until after next month's article.



CROSS MEMBER
2 off – as drawn Mild Steel
2 off – opposite hand Mild Steel

HEADSTOCK STIFFENER
4 off Mild Steel

DRAG BOX
2 off Mild Steel

ALL CHANNEL SECTIONS – 18 SWG

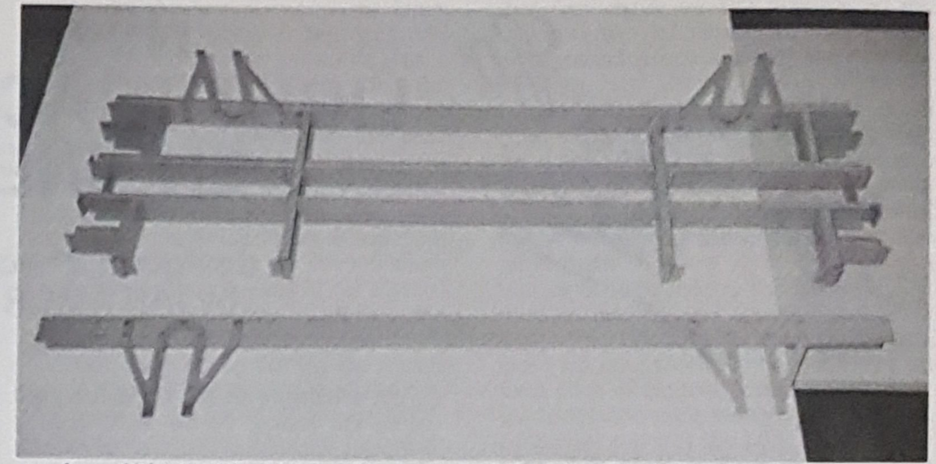
ALL RIVETS IN UNDERFRAME – 5/64" (2mm)

OUTER LONGITUDINAL
2 off – as drawn Mild Steel
2 off – opposite hand Mild Steel

The final items for the underframe structure are the four small cross members which have the double cleats, drilled for the buffer spindle and having the outer brake hangers fixed to the bottom flange. There are also the small longitudinal headstock stiffeners which are used to strengthen the area around the buffers. The only other small item is the drag box which is formed out of 18 swg mild steel sheet (CR4). All of the above items are included in the digitally punched kit.

The order of assembly for the underframe is much the same as for the previously described LMS fish van, working from the inside out. The first job is to fix the end cleats to the two main cross members and the centre longitudinals. The inner cleats can also be fixed to the outer longitudinals and the drag box can be fitted to fix the members together, remembering to fit the cleats on the headstock end which use the same rivets as the outer holes on the drag box. The drag box/outer longitudinal assemblies can then be fixed to the main cross members together with the centre longitudinals and for this I had to use the long rivet sets which I described in the last article. For those who missed this, they are merely 10" lengths of 3/8" round bar tapered at the ends and a dimple formed for the rivet head using a 3/16" ball nose slot drill just deep enough to accommodate the rivet head. The dimple can be polished by hitting the punch on to a 3/16" diameter steel ball. I have not bothered hardening mine, although they would certainly benefit from being made of silver steel and finishing off by hardening and tempering.

The cleats can of course be fixed to the ends of the members using the faithful



A partly assembled underframe of an LNER 20 ton brake van.

Maidstone riveting tool and, if assembled in the correct order, the riveting tool can be used for all the remainder of the assembly. In fact, once I had sorted out the order of assembly, it took me just six hours to rivet the complete underframe using the medium size Maidstone riveting tool.

If you are using the digitally punched kit, before any thought of assembly crosses your mind you will need to wipe the machine oil which has been left from the punching process off all the members, then regardless of origin, all members should be given a coat of red oxide or grey primer using a car aerosol or similar paint. With the digitally punched kits, I also deburr all the edges and take off all the sharp corners – as you will probably gather, this was learned the hard way.

The next pieces to assemble are what I call the buffer spring cross members to the outer longitudinals and finally the short headstock stiffeners. When I assembled the first corner of my brake van I thought it would be easier to fit the short headstock stiffeners to the buffer spring cross members first, but I then had to chop them off again as I could not get the riveting tool in to fix the cross members to the outer longitudinals.

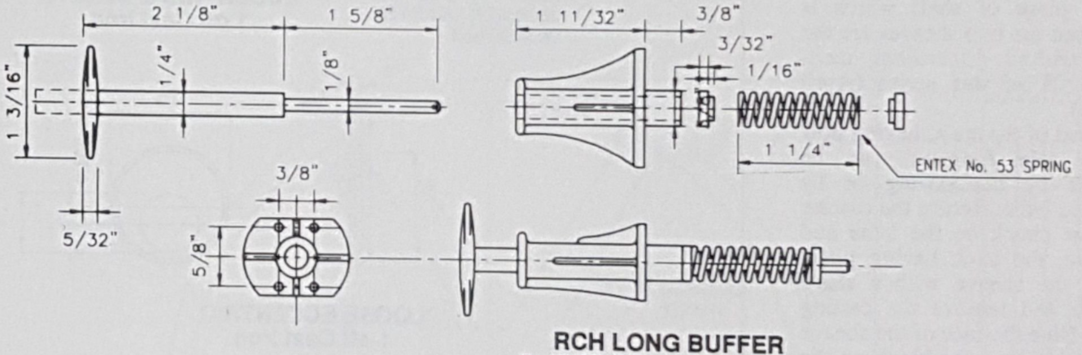
I have shown the solebars with standard RCH 'W' irons as fitted to the LNER brake vans, though if you are building the BR version, then the axleguards consist of two separate solid plates, the left hand one of which in each case has a 1/4" hole drilled in it and is used on full size wagons for inserting the brake stick to lever the brake down. On the model brake vans, the hole is of course redundant, but it just happens to be a standard BR fitting. For those who are wanting to build a genuine BR vehicle, I will include the drawings for the standard BR axleguards next time.

For those who are wanting to crack on with this vehicle, I have included drawings of the buffers, leaf springs and axleboxes which again are made in the same way as described in the previous series.

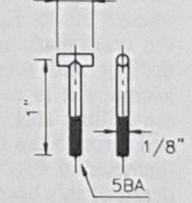
Just a word about the buffers though. All of the LNER vans had the long type RCH buffers as they were all vacuum fitted and were fitted with screw couplings. A lot of the BR vans were fitted with Instanter couplings and had the shorter RCH buffers, and the BR grey painted unfitted vans also seem to have had the short RCH buffers and Instanter couplings.

There is a wide choice of axleboxes as the original LNER vans appear to be fitted with the 9" × 4 1/2" RCH axleboxes with the recess in the top, though the later vans are fitted with the LNER cast steel boxes which are fitted with the separate front cover lettered LNE. The early BR vans seem to be fitted with the standard RCH 10" × 5" axleboxes without the recess in the top, though I would certainly not regard this rule as being sacred; later BR vans were fitted with the very square BR standard plate front boxes as seen in the header photograph of this series. The last brake vans to be built were the ones to diagram 1/507 which all had roller bearing axleboxes which entailed fitting small hornblocks to the axleguards similar to

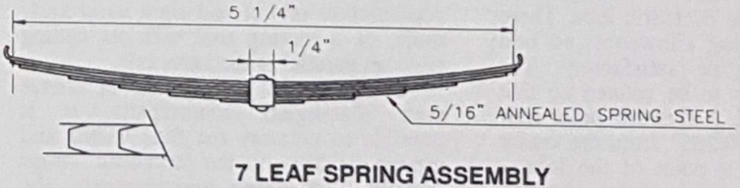
Continued on page 14



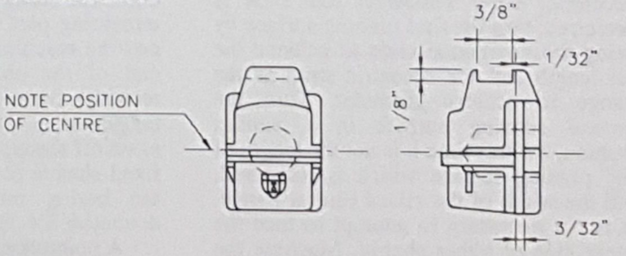
RCH LONG BUFFER
4 off Mild Steel & Cast Iron



SPRING HANGER
8 off Mild Steel



7 LEAF SPRING ASSEMBLY
4 off Spring Steel



RCH 10 × 5 AXLEBOX
4 off Cast Iron

Nº 4 LIGHT TRACTION ENGINE

A design in 2" scale by IAN AMOR

Part Thirty-one

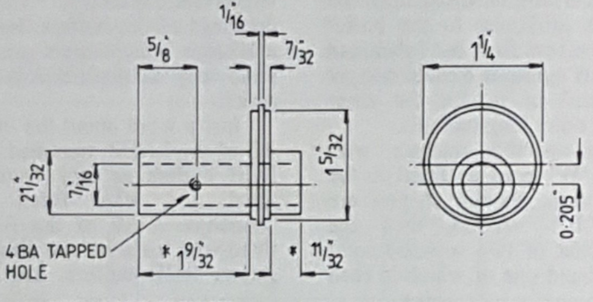
ECCENTRICS

The eccentrics on the full size engine are cast as one piece, machined and then keyed on to the crankshaft. I am not so much of a masochist as to try that, but I do want it to look as though I did! The casting for the eccentric assembly is essentially a cast iron stick with the two eccentrics cast side by side and in line, but apart from each other. The stick extends beyond both eccentrics and the part between them is slightly larger than both of the ends; one end is also a little longer than the other.

Begin the machining by taking a file to the longer of the two ends so that it can be gripped in the three-jaw chuck firmly, before skimming the shorter end to a clean surface. Reverse the casting in the chuck and, having regard for the finished thickness of the eccentric sheave and allowing a machining allowance for the other side, face the sheave and turn the shaft to $^{21}/_{32}$" diameter. Do not face the end of the shaft yet – the length of this and the short piece of shaft which is currently between the two sheaves are the other two asterisked dimensions mentioned in part 28 of this series (April 1997, page 310).

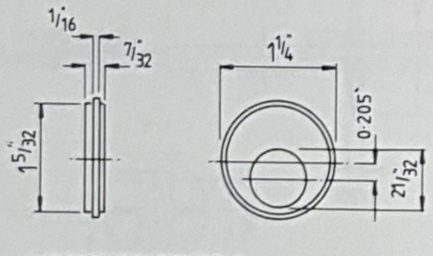
The short end of the stick, having now performed its sole function, can be removed either by hacksawing or by parting off in the lathe. Return the casting to the three-jaw chuck on the lathe and face the sheave, the stick having gone. Lightly nudge the sheave with a sharp tailstock centre and remove the casting from the lathe. Blue the face of the sheave and lay the casting in a vee block on the marking-out table. A line needs to be drawn through the centre extending to the highest point of the eccentric lobe. There is a good machining allowance, so best endeavours are quite satisfactory. The casting now needs to be rotated so that this line is vertical. A crossing point now has to be marked 0.205" from the centre towards the highest point of the lobe – this will be the centre of the sheaves, 0.205" being half of the full valve travel. As a double check, a pair of dividers set to $^{5}/_{8}$" radius should, with one point on the crossing, scribe a circle within the periphery of the casting – if it does all is well and you can centre pop the crossing. There is one great advantage to making the eccentric sheaves together in this way. If the offset measurement is out, i.e. 0.200" or 0.210", even though the valve travel will not be as designed, it will be even on both eccentrics. This is not a licence to be sloppy, however.

Fit a four-jaw chuck to the lathe and mount the casting by the shaft, leaving sufficient clearance between the chuck jaws and the nearest sheave to allow for machining the edge. Set the sheave centre to run true. Commence the machining by reducing the outside diameters of both sheaves to $1^{1}/_{4}$". With the eccentric straps both having been turned to a gauge, they can be bolted up firmly and used as the gauge when machining the running surfaces of the eccentric sheaves. The cutting can be done with either a combination of left and right hand knife tools, or a parting tool with its cutting edge set parallel to the lathe axis.



* THESE DIMENSIONS MAY NEED TO BE ADJUSTED ON ASSEMBLY

ECCENTRIC & SLEEVE
1 off Cast Iron



LOOSE ECCENTRIC
1 off Cast Iron

Using vernier calipers, or of course their dial/digital counterparts, it is possible to measure the face widths and groove widths of the eccentric straps directly. With these measurements, the edges of the eccentrics can be completed. Beginning from the faced side of the first eccentric, using whichever tool style is preferred, turn the first running surface by using the compound slide to achieve the set length and the eccentric strap as the gauge to achieve diameter. Turn the second running surface in a similar fashion, but this time it is not the length of the running surface which is measured, but the width of the raised central flange. It is not necessary to attempt to face the inner side of either sheave. Machine the edge of the second sheave in the same manner. Before going any further, bolt up both eccentric straps to the sheaves and check that they will run properly. Once the casting is dismounted from the lathe, it will be very difficult to make any changes to the eccentrics.

Remove the eccentric sheave assembly from the four-jaw chuck, change to the three-jaw chuck and grip the sheave assembly, holding it by the shaft. Drill a $^{3}/_{8}$" hole through the whole length of the casting. This bore ultimately needs to be opened out to $^{7}/_{16}$" and to be a close fit on the crankshaft, and this can be done by drilling and reaming, but for complete accuracy it is best done by boring. With the drilling still at $^{3}/_{8}$", open out the front end through the first eccentric sheave to a diameter of $^{21}/_{32}$" with a boring tool. The depth of this bore should be no more than the thickness of the sheave plus $^{1}/_{32}$" to $^{1}/_{16}$" in which to hacksaw. When the boring is done, the sheave should be sawn off. The remaining part of the eccentric shaft can now be machined to a finish. Reduce the end of the shaft that part which was recently between the sheaves to $^{21}/_{32}$" outside diameter using the bore of the sawn off sheave as a gauge. Face back the fixed sheave to $^{7}/_{32}$" thick, then complete the boring out of the shaft to $^{7}/_{16}$" diameter.

A point of explanation at this juncture.

Model engineering drawings are not, as a rule, toleranced. As a generality, this would be unnecessary anyway, because one piece is made to fit the next, but sometimes a tolerance is required. If such a thing were to appear however, whilst some would recognise it, many would not. Anyway, the chasing of thous is not really necessary as long as the parts all fit fairly well. We are, after all, our own quality assurance assessors. However, at this precise point, a little tolerance is required. If all the parts are made *exactly* to the drawings, the eccentric straps will jam together when everything is assembled. The straps are 7/32" wide, so are the sheaves and the sheaves are fixed hard against each other. Therefore, just a couple of thou extra should be allowed on the thickness of the sheave, or alternatively the strap thinned by rubbing on an abrasive sheet to achieve a free running assembly. Remember, we are only talking 'whiskers', not great gaps – what the late LBSC would have described as a *bare* 7/32" on one and a *full* 7/32" on the other!

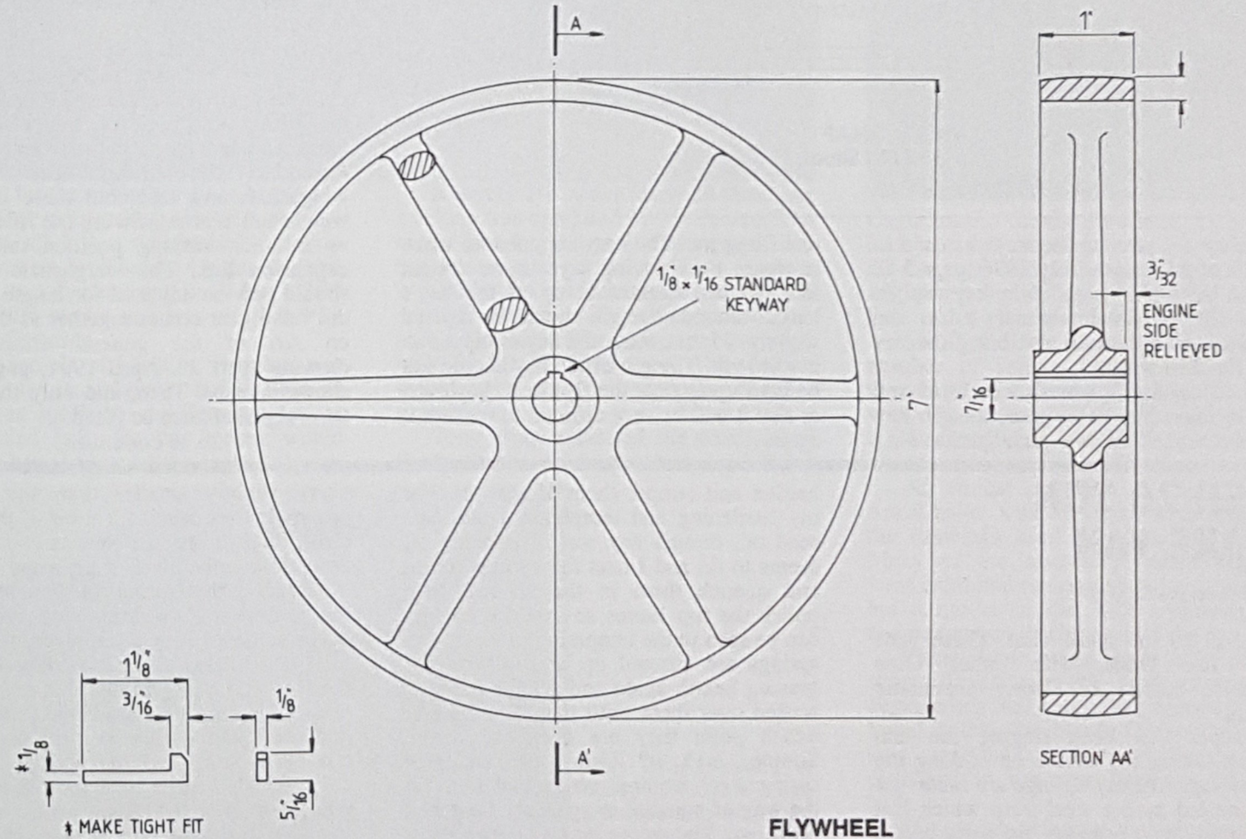
The loose eccentric sheave is fitted on to the short length of the shaft with the machined face inwards. To set the eccentrics in their correct relationship to each other requires a simple jig. However, the eccentric shaft – which, having been bored, I suppose should now be called a sleeve – has first to be brought to length. This can only realistically be done once the connecting rod et al have been made and fitted so that the eccentrics can then be set in line with the expansion link. To avoid undue complication, I will deal with the jig and the final fixing of the loose eccentric sheave when I deal with the setting up of the cylinder and valve gear.

The next logical step is the aforementioned connecting rod et al and these will be the subject of the next article, but there are a few other items which will fit in here nicely. Whilst the lathe is still covered with cast iron turnings, now is an ideal time to make the flywheel. Its diameter is too large to allow it to be swung over the bed of the Myford but with a little ingenuity it will fit in the gap.

Begin the work by fettling the spokes around the hub and the inside of the rim. Now cut a disc of board, chipboard, MDF, plywood or the like, which is 3/4" or so thick to an outside diameter of 5 1/2". Draw a diameter line on the disc and then cut a 1 3/4" diameter hole in the centre. On the diameter line, drill a couple of clearance holes which will be nicely in line with slots in the faceplate. Fit the faceplate on the lathe mandrel and pass two bolts through the faceplate slots, then hang the wooden disc in place. Put the flywheel casting against the disc with the longer side of the hub in the centre hole. The two clamping bolts will pass between two opposite pairs of spokes and on to these bolts now needs to be put some spreader plates. The photograph shows my set-up. The next job is to get the whole assembly running true and this is best done by using a soft mallet to tap the flywheel, checking its truth against a fixed datum. The pattern is good, so that there is little or no run-out between the rim and the hub, but any imperfection will be seen at the rim, therefore check for true running on the inside edge of the rim. When the arrangement is running well, fully tighten the bolts.

Now to the machining. This is all straightforward surfacing and facing but, for those using a Myford size lathe, not quite so. The cross-slide will be at its absolute limit of travel and, because of this, it will be very prone to vibration. The photograph shows a right hand turning tool in the tool holder, but this was only used on the hub and was withdrawn for the picture. To face the edge of the rim, use a left hand tool and clamp it under the front edge of the tool holder; left towards the headstock, right towards the tailstock, back edge towards the lathe centre, front edge right there in front of you. Sorry about that, but I don't want to confuse anyone. This way, the slides are well over each other providing maximum rigidity. The face of the flywheel rim is 1" wide, so cut back the edge, taking note of the spokes – they should ideally be equidistant between both edges.

To surface the rim, the best tool to use is a good stout boring bar with an inserted bit which can be removed from its normal turning position and replaced from the reverse side. Again, this should be clamped under the front of the tool holder. The first step is to turn the rim parallel to 7" outside diameter. Because the engine was intended to be used belted up to work rather than for direct traction, the face of the flywheel must be crowned. To do this, first set the compound slide over in one direction to 1 1/2 degrees or 2 degrees and cut a short taper to extend about one third

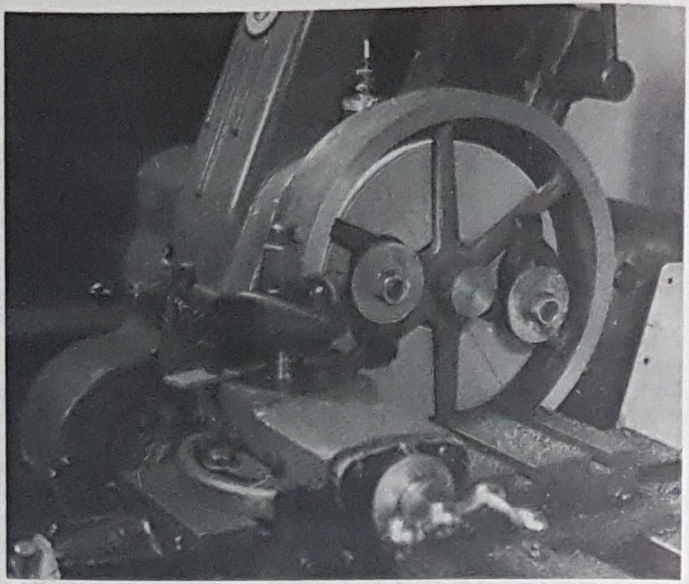


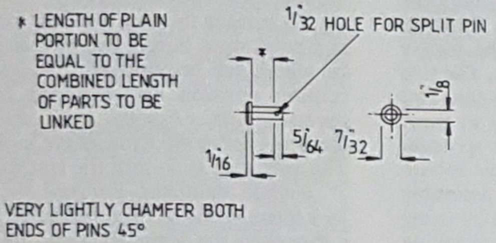
FLYWHEEL
1 off Cast Iron

FLYWHEEL KEY
1 off Mild Steel

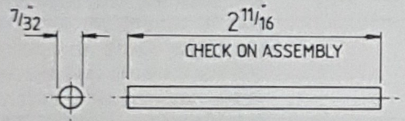
of the width of the face from the edge. Then set the compound slide over in the other direction to the same angle and repeat the process from the opposite edge. To finish the surface to a smooth convex surface, a file can be used but a better way is to hand turn it. A method of doing this is to put the shank of the boring bar across the flywheel face and close to it. Then, with the lathe revolving slowly, a flat scraper can be used in the fashion of the wood turner, with the scraper blade supported by the boring bar. Blend the whole of the crown to a gentle convex curve, finally bringing the surface to a good polish with abrasive papers.

With the rim finished, the hub can be faced, drilled and bored. Boring to size is most definitely recommended – once again, any imperfections on the flywheel will show up on the rim and the slightest wandering of a drill will show up as a wobbly flywheel! Using the same procedure for planing keyways as used in part 19 of this series (July 1996, page 14), plane a 1/8" wide by 1/16" deep keyway. To finish the flywheel, reverse it on the faceplate, face the hub and bring the rim to its finished width.


The set-up for machining the flywheel.


* LENGTH OF PLAIN PORTION TO BE EQUAL TO THE COMBINED LENGTH OF PARTS TO BE LINKED
1/32 HOLE FOR SPLIT PIN
*
1/8
1/16
5/64
7/32
VERY LIGHTLY CHAMFER BOTH ENDS OF PINS 45°

CLEVIS PIN FOR VALVE GEAR
Silver Steel



WEIGHSHAFT
1 off Mild Steel

To allow the flywheel to be fitted and used to move the valve gear, the gib key must be next. This is a plain hacksawing and filing job. The only comment to make is where the drawing says 'make a tight fit', the last quarter or so of the key's length towards the gib should be tapered slightly, so that when the key is tapped in it will lock. The gib of the key should not be hard up against the flywheel, however, or else it will be very difficult to remove it again.

The last small parts for making this time are the pins which hold the valve gear together. Made from silver steel, they can be hardened if experience shows this to be necessary. The length of the shank depends upon where the pin is to be fitted. I have a little scriber with a flat ground on one side for marking the position of the split pin hole, but this is not critical. The weighshaft comes last and completes all the parts for the valve gear. The lifting arm and weighshaft arm are held in place by 1/16" taper pins – in full size practice they were keyed and fastened by a set screw. As the general arrangement drawing shows, these two arms are at 90 degrees to each other and the assembly fits freely without shake through the weighshaft bracket.

The valve gear excluding the eccentric arms can be assembled around the cylinder and trunk guide and it is now that the lifting arm end of the weighshaft bracket can be trimmed to length. Assemble the lifting arm to the weighshaft and assemble these into the weighshaft bracket. Swing the lifting arm up into its working position under the expansion link. The weighshaft bracket should now be adjusted for length so that the valve gear comes together as the view on AA of the general arrangement drawing (part 28, April 1997, page 310) shows it to be. Then, and only then, can the weighshaft arm be fitted.

To be continued.

LNER 20 TON BRAKE VAN

Continued from page 11

the LMS 20 ton brake vans. These vans were also fitted with either Oleo hydraulic buffers or Dowty pneumatic buffers.

People still keep ringing me and writing asking for advice on making the leaf springs. All my springs are made out of annealed spring steel strip which can be clipped with ordinary tin snips and it can be drilled and formed just like ordinary mild steel. My method is to assemble the springs completely and harden and temper them afterwards. For my hardening and tempering I use rape seed oil, though any sort of cooking oil seems to do and I heat the springs to red and quench them in the oil and then polish the top leaves so that the colours can be seen in the tempering process. The springs are cleaned up and laid on the brazing hearth again and a light flame is wafted over them until they turn blue at which point they are quenched again. Simple, isn't it? Using the annealed spring steel requires no special tools in the way of punches or specially hardened drills, etc. The spring leaves should all be formed to a curve prior to assembly and I just simply bend them round the edge of a piece of plywood that has been cut to a curve slightly smaller than the radius required. This called for a bit of trial and error, though all the leaves were bent around the same piece of plywood.

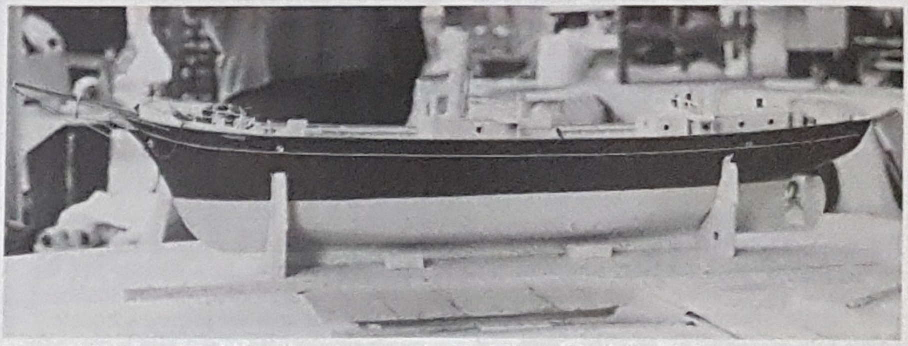
Finally, the spring hanger pins are made from 1/8" welding rod which is silver soldered into a tee piece, threaded 5BA and drilled about two threads from the end with a No. 54 drill for a 3/64" split pin. The spring pins are fitted with a nut and a lock nut so that once the brake van has been completed the springs can be adjusted with these nuts so that all four wheels stand on the rails.

Next time we will start tackling the brake gear.

To be continued.

The 17th Exhibition of Liskeard Model Society

by Anthony Mount



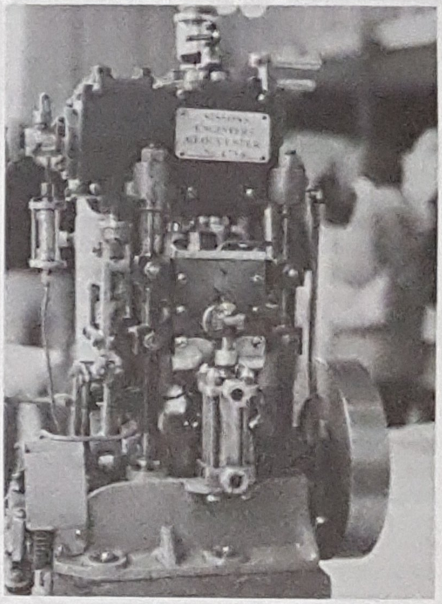
The unfinished model of Shackleton's research ship 'Nimrod' built by Mr Lynas.

Liskeard Model Society held their 17th Exhibition over the weekend of 1st/2nd March. As the title of their society suggests, the members of the society always put on a good range of modelling in all disciplines, not only model engineering.

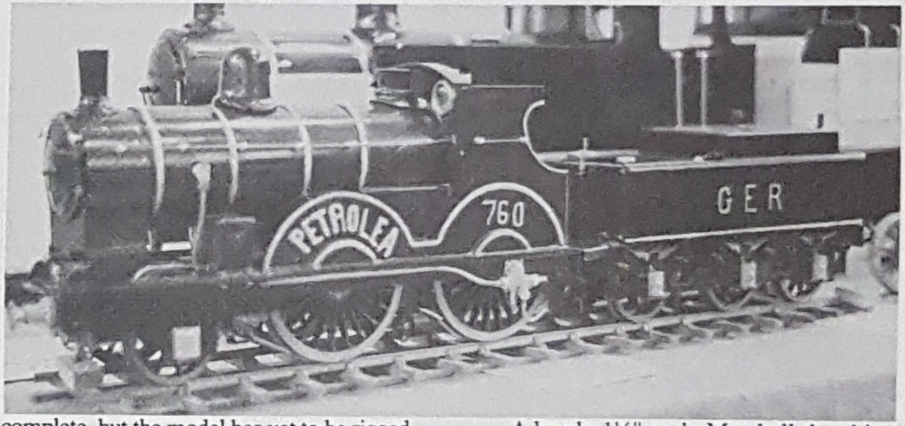
This year the exhibition was held in Liskeard school and made use of the gymnasium and assembly hall. The canteen was open for refreshments, manned by the ladies of the society.

One of the first exhibits to catch my eye was a superb model built of Shackleton's research ship 'Nimrod' used in the Antarctic expedition of 1907-1909. The ship was originally built in 1866 for the whaling industry and Mr Lynas, the builder of the model, had to conduct much research in order to gain the little information available about the ship. The hull is complete, but the model has yet to be rigged.

Right: The full size Sissons launch engine No. 4756 recently refurbished and exhibited by Mr Edwards.



Below: This well engineered 3½" gauge 'Petrolea', designed by LBSC, was let down by indifferent lettering.

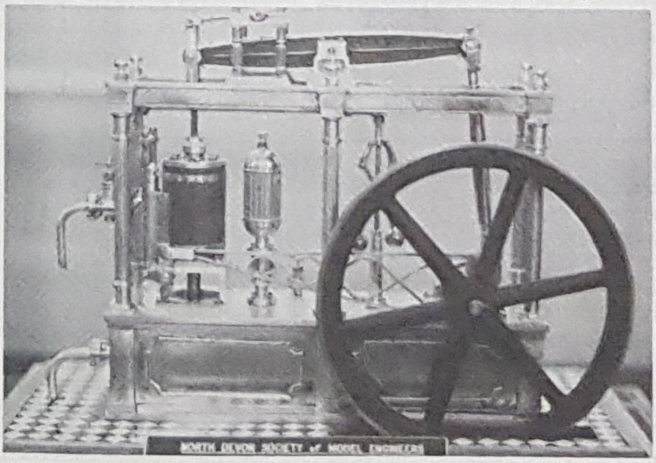


Another outstanding exhibit was not a model at all but a refurbished full size launch engine by Sissons. Originally built in 1910 as a dynamo engine, it has a 2½" bore by 2½ stroke and was exhibited by Mr H G Edwards.

An example of LBSC's 'Petrolea' was on show by an unknown builder, but its finish was spoilt by indifferent lettering. Professional help for this matter would certainly have improved the engine's looks.

A lovely 1½" scale Marshall threshing machine was exhibited by Mr Pearce. The model just begged to be connected to a traction engine or a portable engine. Ironically, the perfect engine for the job could be found on the other side of the hall, a 1½" scale Marshall portable engine built by Mr W Wellington. This engine would have complemented the thresher superbly.

Tony Bray exhibited his example of 'Lady Stephanie' to the design of Tubal Cain. Except for the flywheel, the model had been left unpainted, so the finish of all the parts had to be near perfect! The engine was displayed on a neat 'tiled' base with a plate giving relevant details.



Tony Bray's model of 'Lady Stephanie' was left unpainted except for the flywheel, so the finish of the machined components had to be exemplary.

Mr D Gillard of Devon exhibited a number of sailing luggers. All of the vessels were made to a very high standard with the paintwork being applied by brush, though you would be hard put to observe this.

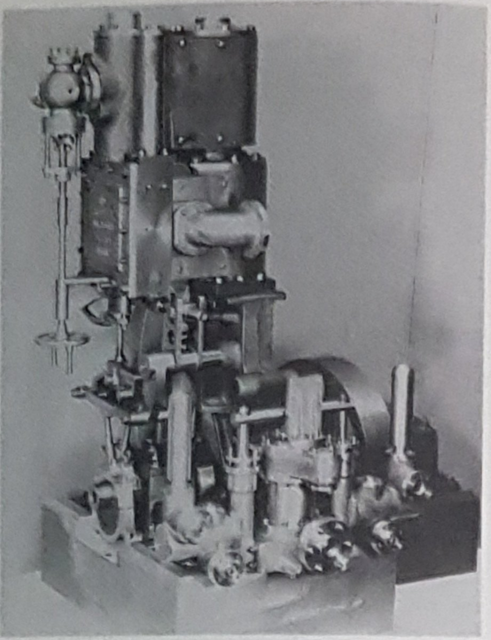
An almost complete Aveling-Barford petrol roller was exhibited with some of the drawings used to make the model. Many of the stationary steam engines were exhibited running on compressed air, but a model of the RLE stationary oil engine ran quietly throughout the day.

There were many more exhibits on show illustrating the wide range of engineering and modelling talents to be found within the North Cornwall/Devon area, including a row of locomotives displayed in the area between the two halls.

If you are planning to visit the West Country next year, keep an eye open for the Liskeard show – you won't be disappointed!

THE SHELDON COMPOUND STEAM ENGINE

John P Bertinat



Part Thirteen

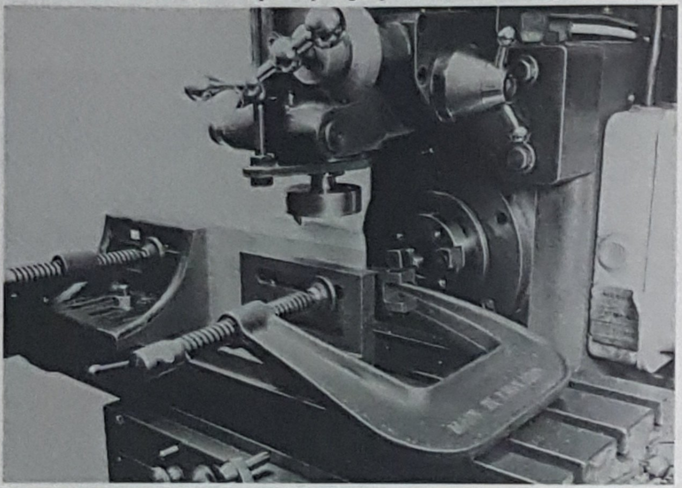
Before commencing this month's description, I wish to point out that the caption to the drawing of the special mild steel tubular spanner for setting the piston valve was accidentally omitted from last month's article. An apology is offered for any confusion caused.

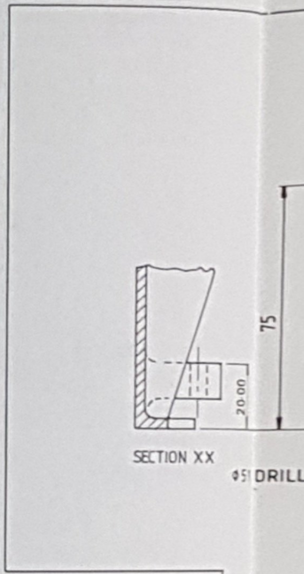
Engine & Outboard Bearing Plinths

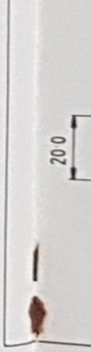
These two plinths are each built up from four aluminium castings, mitred at their corners and bolted together by means of ingeniously placed lugs. On account of their inevitable lack of symmetry, the castings (particularly the longer ones) were slightly distorted, being concave on their outer faces. I carried out a limited mount of correction by clamping them at their ends to a milling machine table, suitably packed up to clear the flanges and skimming as much of the surface as could be reached by my trusty fly-cutter. The portions beneath the clamps were levelled with a dreadnought file. The finish obtained was not spectacular and I could not entirely machine out the 'riser' points in the casting, but this was immaterial since the bases had ultimately to be filled and painted. I did however obtain a surface sufficiently accurate to serve as a datum. For the shorter castings used on the outboard bearing, filing alone proved adequate.

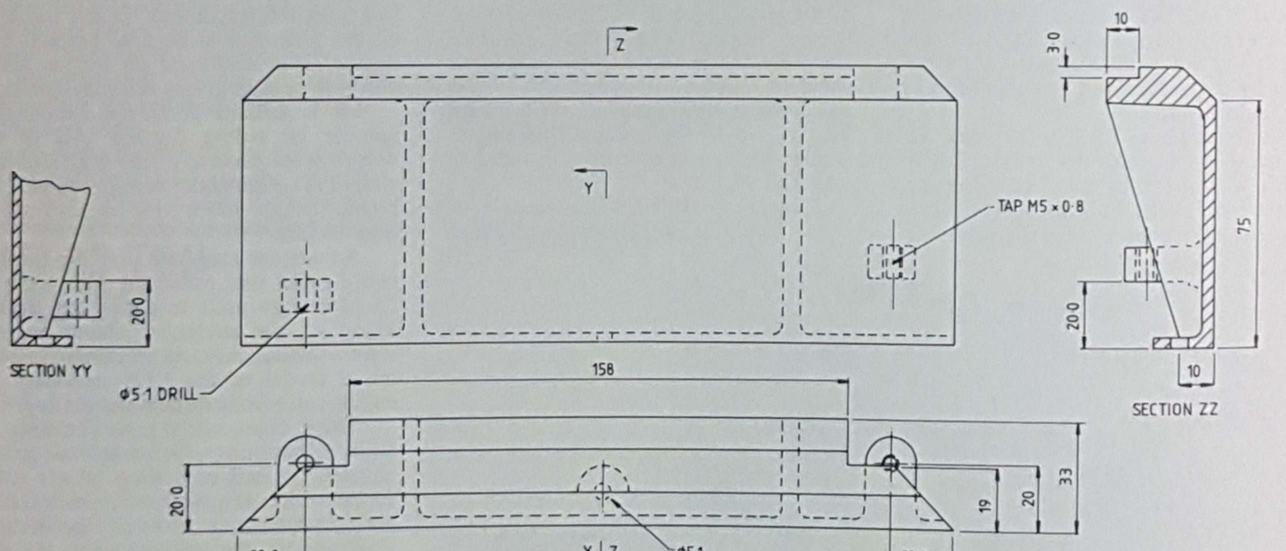
If the corners of the plinth are to fit accurately together, extreme care must be taken in machining the mitres

Flycutting the top face of a plinth casting, supported on the milling machine table and held to a pair of angle-plates with G-cramps.









PLINTH – FRONT & BACK
2 off Cast Aluminium Alloy

NOTES FOR PLINTH ASSEMBLY

VERY CAREFUL MACHINING IS REQUIRED ON ALL CORNERS TO ENSURE THAT

(a) THE BOLTING LUGS CORRESPOND AND

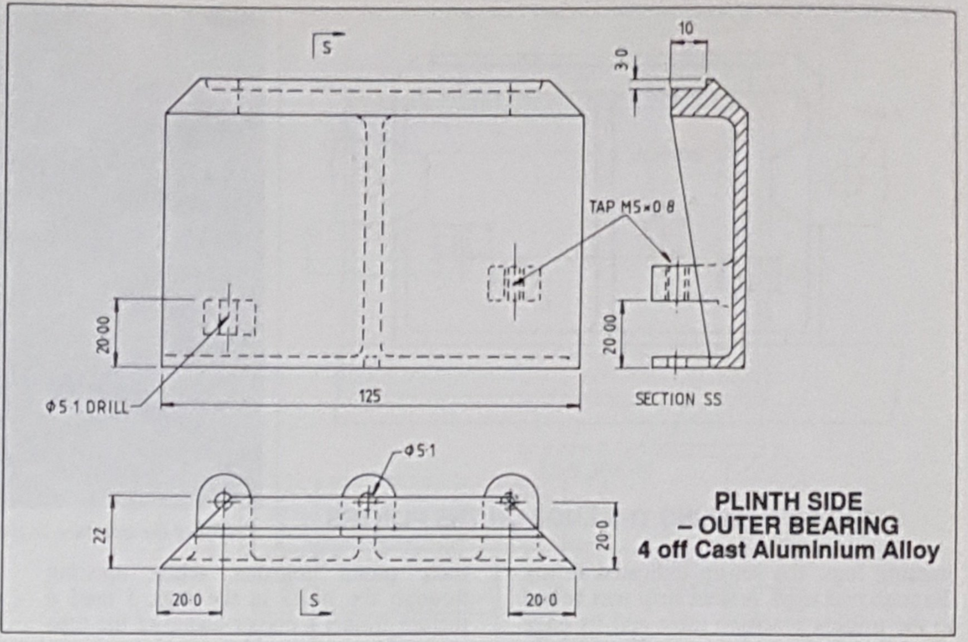
(b) THERE IS A MINIMUM JOINT GAP.

THE TOP PLATES MUST LIE FLUSH WITH THE CASTING TOP SO MACHINE LEDGE TO 3.1mm BELOW TOP EDGE AND THEN FILE FLUSH TO PLATE.

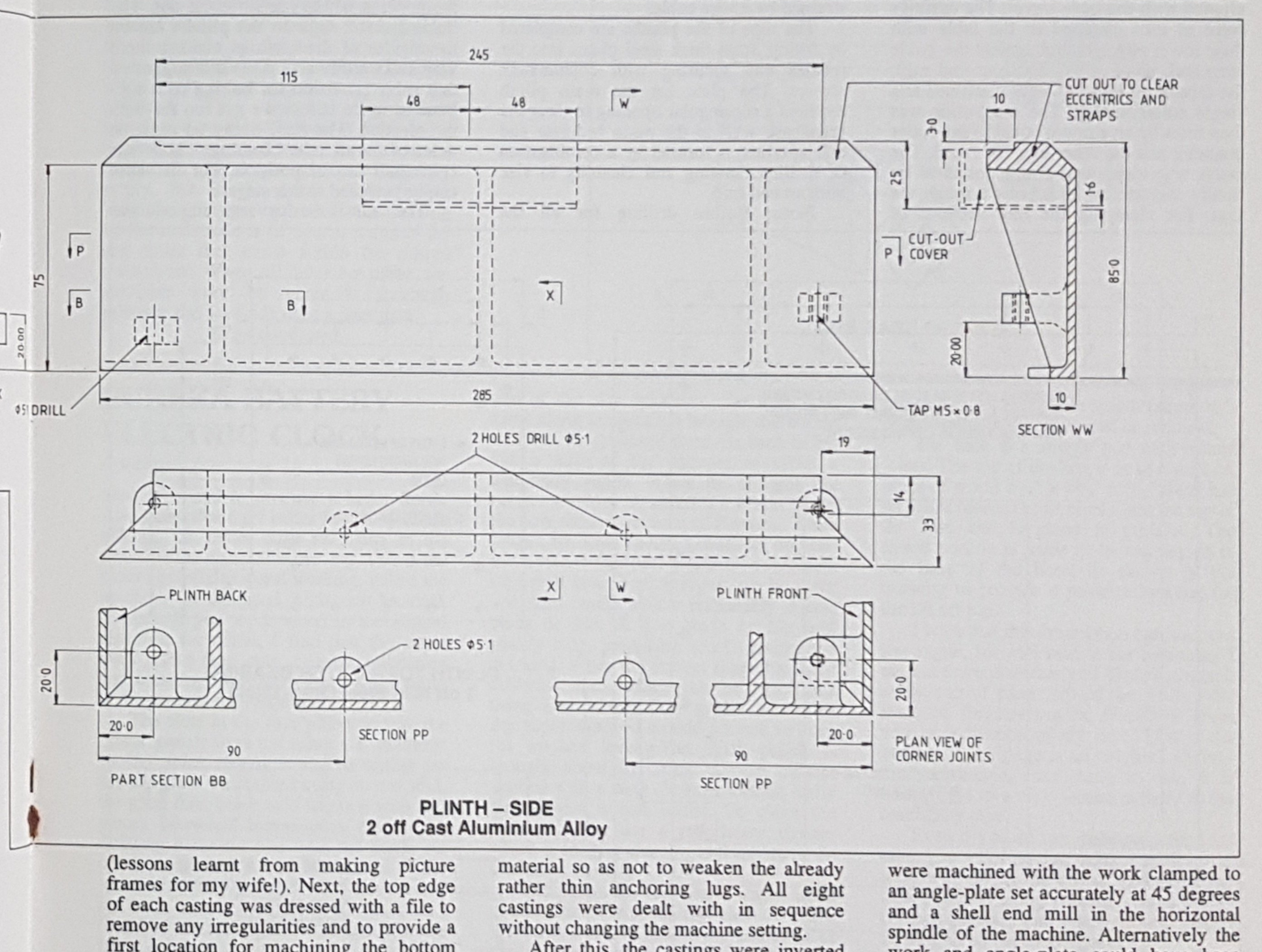
USE A PRE-PAINT FILLER BETWEEN ALL JOINTS AND TO CONCEAL COUNTERSUNK SCREW HEADS.

OUTER FACES GIVE MINIMAL CLEANING AND SCORE TO REPRESENT STONE BLOCKS. SPRAY PAINT WITH ETCH PRIMER AND FINISH MATT TO CHOICE OF COLOUR.

A VERY SMALL RADIUS FILED ON VERTICAL CORNERS WILL REDUCE ACCIDENTAL CHIPPING.



PLINTH SIDE – OUTER BEARING
4 off Cast Aluminium Alloy

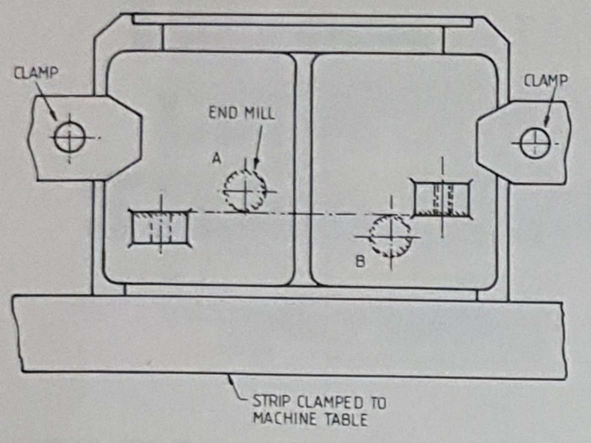


PLINTH – SIDE
2 off Cast Aluminium Alloy

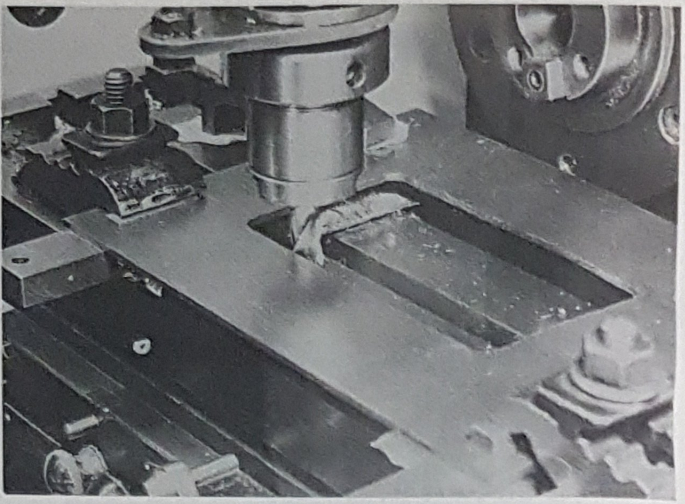
(lessons learnt from making picture frames for my wife!). Next, the top edge of each casting was dressed with a file to remove any irregularities and to provide a first location for machining the bottom edge. For this latter purpose, each casting was clamped base edge up against an angle-plate or against two angle-plates for the larger castings bolted to the table of the vertical miller and the bottom edge of each casting machined with a flycutter. removing the minimum amount of material so as not to weaken the already rather thin anchoring lugs. All eight castings were dealt with in sequence without changing the machine setting.

After this, the castings were inverted in turn on the angle-plate(s) and the top face machined to bring all parts to a uniform height of 85mm. The eight castings were then remounted and passed under a suitable milling cutter to form the rebate for the capping plates. After marking all castings to length, the mitres were machined with the work clamped to an angle-plate set accurately at 45 degrees and a shell end mill in the horizontal spindle of the machine. Alternatively the work and angle-plate could have been clamped to the lathe boring table with the mitre to be cut facing the headstock and the machining performed with a flycutter of sufficient sweep to compensate for the lack of vertical feed or again a vertical slide might be used.

For accurate machining of the corner



SET-UP FOR MILLING THE LUGS ON THE PLINTHS



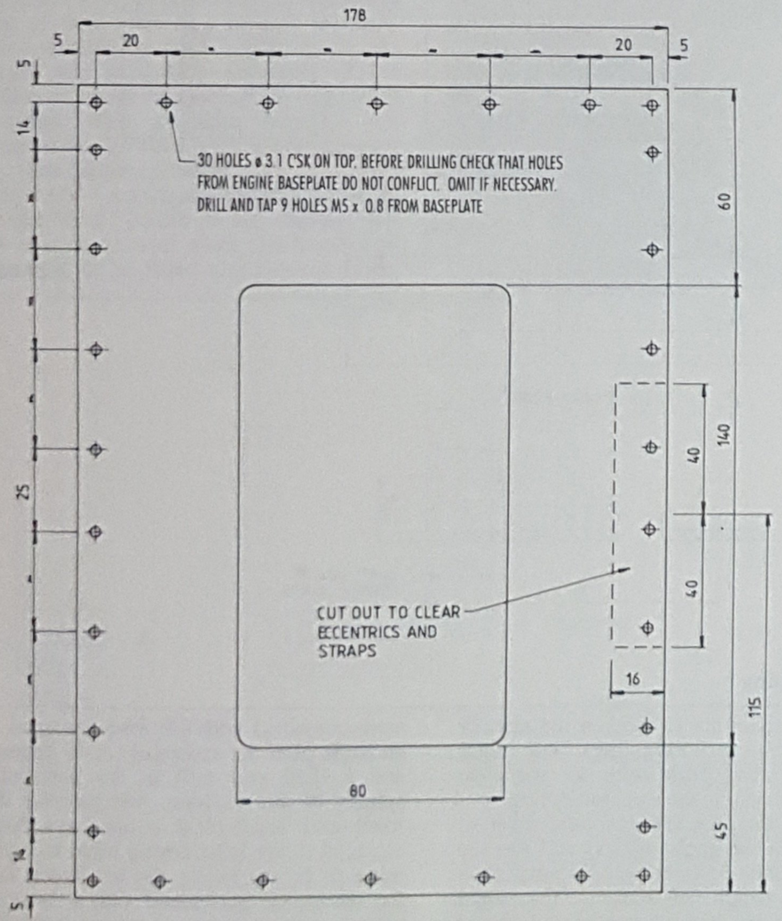
Profiling the aperture in the plinth top plate using a slot drill.

jointing lugs, the set-up indicated in my diagram was used. A steel strip was bolted to the milling machine table and its edge aligned with the table travel. The castings were in turn clamped to the table with their lower edges butted against the guide strip and, using a 1/2" diameter end mill, the tops of all lugs 'A' were machined at a single cutter setting. The cross-slide was then reset by an amount equal to the cutter diameter and the other lugs 'B' faced. The result was eight well fitting joints to be finally secured by 2BA bolts through the lugs. For clamping the four sections of each plinth together while spotting through the holes in the lugs, I used a picture framer's corner clamp of the type strained by a wire cable.

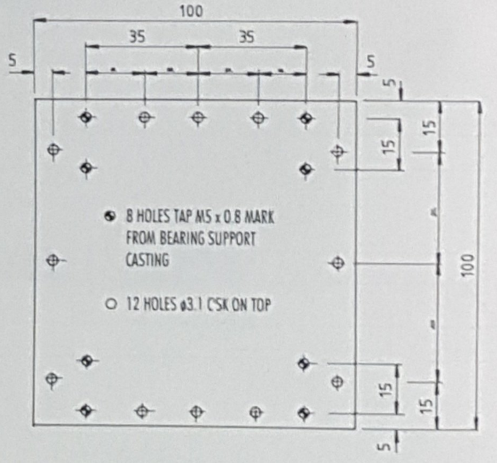
The tops of the plinths are completed by fitting 3mm thick steel plates into the rebates and securing with countersunk screws. The plate for the main plinth requires a rectangular opening to clear the crankcase well in the main bedplate and this aperture is formed by a combination of drilling. sawing and cleaning to size with an end mill.

Note: Before drilling for all the countersunk screws, do check the positions of the engine bedplate and the outer bearing holding down studs and also the position of the eccentric cut out. The holding down lugs on the plinths are on the insides of the castings making them very awkward to access, so it is suggested that some provision for bolting to a sub-base be made before we get too far with the erection. The final lining up must be deferred until the bearings and the crankshaft are in position, but the base can be prepared at this stage.

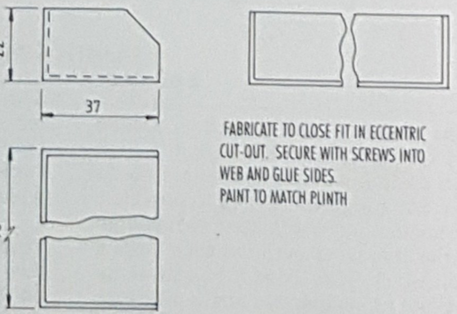
The sub-base for my engine was


178
5
20
20
5
5
14
30 HOLES ø 3.1 C'SK ON TOP. BEFORE DRILLING CHECK THAT HOLES FROM ENGINE BASEPLATE DO NOT CONFLICT. OMIT IF NECESSARY. DRILL AND TAP 9 HOLES M5 x 0.8 FROM BASEPLATE
60
140
40
40
25
CUT OUT TO CLEAR ECCENTRICS AND STRAPS
16
115
80
45
14
5

MAIN PLINTH TOP
1 off Mild Steel (3mm thick)


100
35
35
5
5
5
15
15
8 HOLES TAP M5 x 0.8 MARK FROM BEARING SUPPORT CASTING
12 HOLES ø3.1 C'SK ON TOP
100
15
15
5

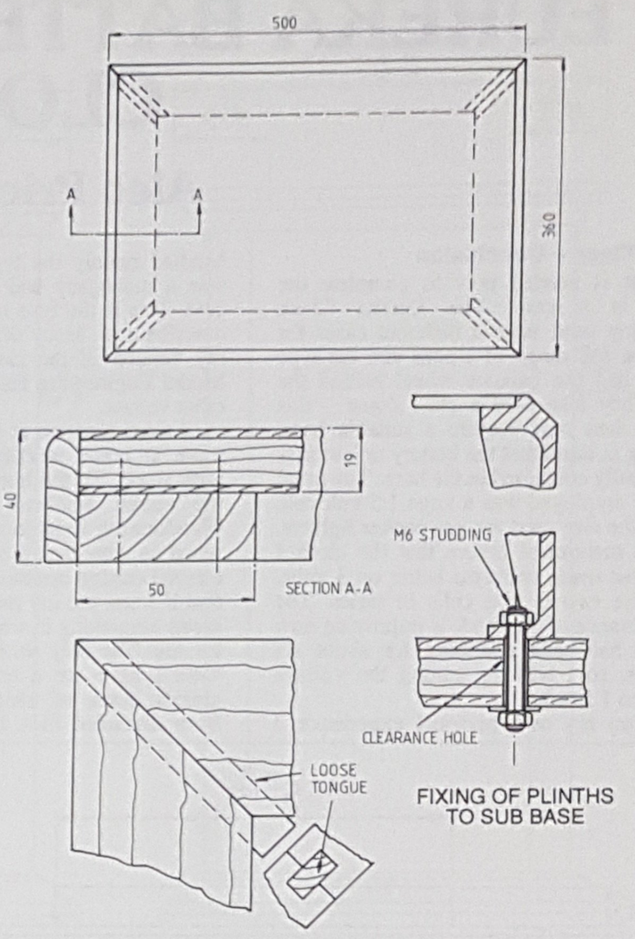
PLINTH TOP – OUTER BEARING
1 off Mild Steel (3mm thick)


22
37
96
FABRICATE TO CLOSE FIT IN ECCENTRIC CUT-OUT. SECURE WITH SCREWS INTO WEB AND GLUE SIDES. PAINT TO MATCH PLINTH

PLINTH CUT OUT COVER
1 off Mild Steel (1.6mm thick)

constructed from 20mm thick veneered block board (ex-shop fitting) suitably reinforced and edged and well painted. The sizes given on the drawing may be taken as a guide only – I made mine as small as reasonably possible, but some fixing problems might be simplified if it were made slightly wider so that all the fixings to the engine plinth came within the perimeter of the underframe. If the given sizes are used, care will need to be taken with the positioning of any screws used to fix the mitred framework to the base slab, to ensure that they do not foul any plinth fixing studs: the 10mm thick hardwood capping strip is glued (using waterproof glue) to the sides of the base after the latter have been planed square. I employed M6 studding to fix the plinths to the sub-base, the arrangement being as shown in the drawing. Due to the inaccessibility of the lugs on the plinth (without removing the top of the plinth!), I locknutted the studs into the castings and then pushed them through the holes in the sub-base. To locate the positions of these holes, I made a stiff cardboard template of the underside of the base, using 'brass rubbing' techniques, i.e. rubbing the card with a soft pencil and thus outlining the contours. This template was then transferred to the sub-base and the holes marked through. Clearance holes were drilled in the hope of absorbing any errors, but in the event slight further 'adjustment' was required. Counterboring on the underside is of course required for any holes that come within the mitred framework. When *all* holes are made, the sub-base may be given a thorough priming and set aside until a later date.

To be continued.



SUB BASE DETAILS

EUREKA BATTERY ELECTRIC CLOCK

Continued from page 21

used for metal to produce a better finish. Also I find that I get better results by climb milling, i.e. cutter edge revolving in the direction the material is moving. This is the exact opposite to metal working, unless the machine is equipped with anti-backlash devices. If you work wood in the normal direction for metal, I find that the cutter tears rather than cuts, causing splintering and breaking away with the grain, leading to deeper cuts than required!

The slots in the four pillars to take the 'glass' panels were cut using a 3" diameter by $^{3}/_{32}$" thick slitting saw. The setting for the top glass was milled using an end mill, the glass then being held in place with thin pieces of wood tacked into place with ordinary domestic pins with the heads cut off. I mentioned in the first article of the series that the glasses were bevelled. I started to bevel proper glass for mine but I found it rather difficult. In the case that has been exhibited, the 'glass' is secondary glazing material as sold by many d.i.y. outlets. This is only 2 to 2.5mm thick, which is not thick enough to bevel, so it had to be left plain. For the brass case which I have just made, I found a source of $^{3}/_{16}$" thick Perspex. Having the misfortune of our car being broken into by smashing one of the side windows, the man who came along to replace it brought the wrong window. He produced from the back of his van a sheet of $^{3}/_{16}$" Perspex to effect a temporary repair. When he brought the correct window, he asked if I would dump the now redundant piece of Perspex. While I don't advocate having vandalism on your car, a visit to the local windscreen replacers may well bear fruit! Perspex can be sawn and filed easily with a reasonably coarse blade or file. A fine blade or file will readily clog, producing local heating and cracking. When the correct shape has been achieved, the surface can be repolished using successively finer grades of wet or dry paper wrapped around a block to keep the surface level. The final polish is brought about by using chrome cleaner applied with a new chamois leather, lastly buffed with a soft duster. To clean the panels, I then use a proprietary cleaner which is sold for cleaning and anti-static on secondary glazing.

The pillars are each made with a small square extension at the top, each of which is let into a square hole in the underside of the top frame and then glued. I have found a very good but expensive glue is 'Timber Tix'. This is quite strong, but with gap filling qualities – necessary with my woodwork! The bottom of the hood is attached to the pillars with No. 6 × $1^{1}/_{4}$" long wood screws. Because you are screwing into the end grain of the pillars, pilot holes for the whole length (about $^{3}/_{4}$") of the screw in the pillar will be required.

The base is a simple box with mitred joints. The top of the box is in two parts. A piece of wood $8^{1}/_{4}$" × $6^{5}/_{8}$" × $^{5}/_{16}$" thick has its edges rebated to fit nicely into the top of the base and is glued in position. The raised portion is made to be an easy fit in the base of the hood as shown in the drawing to provide a positive location for the lift off top.

I hope that this description has not been too vague, but as I said at the beginning I am not a woodworker yet! The photograph at the top of page 290 of the April 1996 issue of *Engineering in Miniature* gives you an indication of my case. That at the bottom of the page is an original, slightly more elaborate, case made in oak. It is constructed in a very similar manner to the mahogany case.

Even if you do use mahogany for your case, you will find that using a spirit wood stain will enrich the colour. My case was then polished using Rustins button polish (French polish), with just a drop of boiled linseed oil on the rubbing pad.

It only remains for me to wish you every success in your endeavours. I know from speaking to many people that quite a number of the clocks are being produced up and down the country, so I hope to see some of them at the next Midlands Model Engineering Exhibition, even if the clock is only part complete in the display case.

EUREKA BATTERY ELECTRIC CLOCK

Alec Price FBHI

Part Fifteen – Conclusion

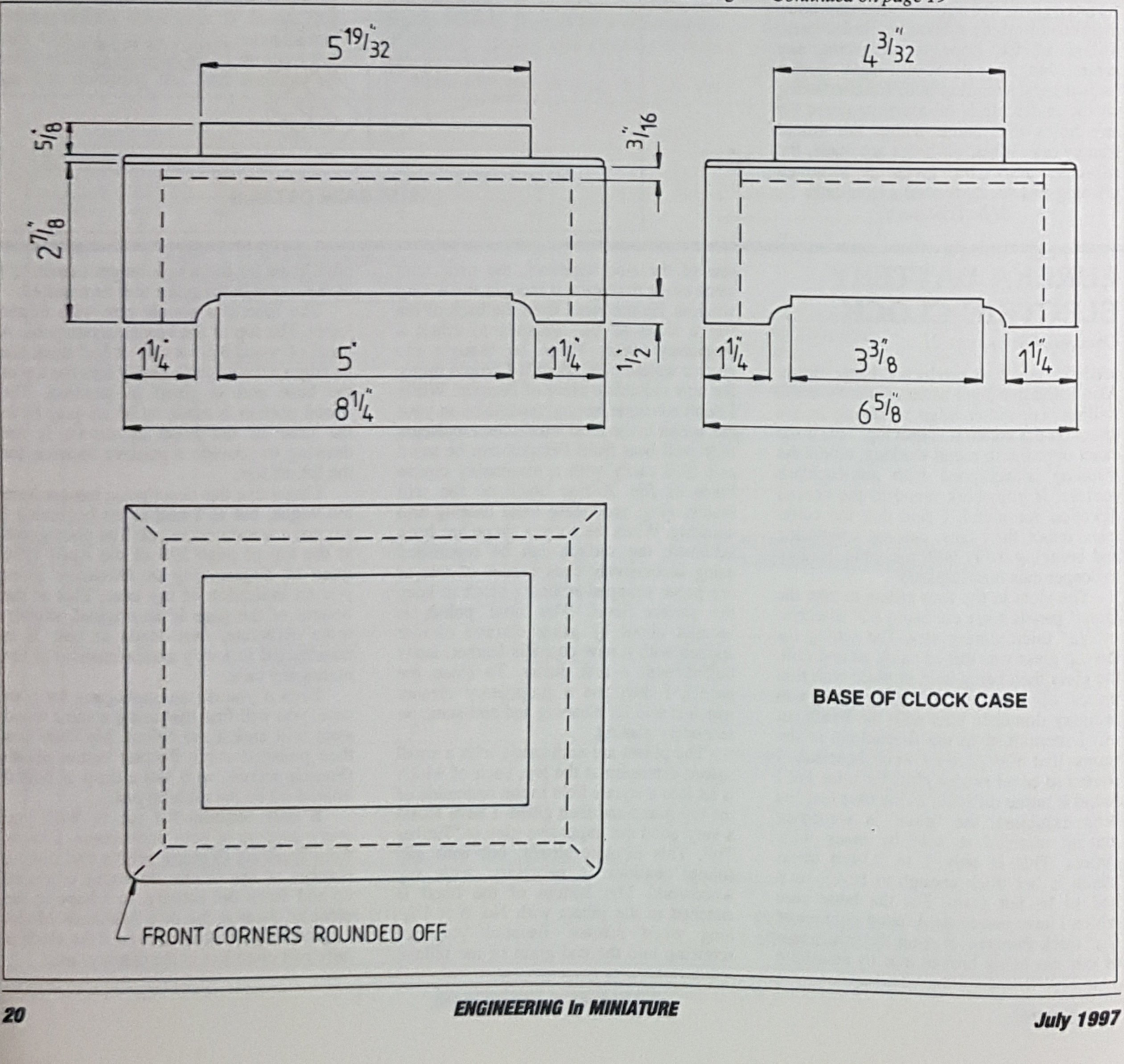
All that is needed now to complete the clock is a case. The Eureka Clock Company used several different cases for both the tall range of clocks and the type which had the balance wheel behind the dial. They also used a glass dome – this would then only require a suitable base, bearing in mind that the battery or batteries are usually contained in the base. The usual battery employed was a large 1.5 volt cell, about the size used for gas cooker lighters. I have mentioned before that the clock I have just made performs better on 3 volts, so I use two D size cells in series. The performance of the clock is improving now that it has been operating for about six months, so I will try cutting the voltage down to 1.5 volts.

From my own personal experience, I handled mainly the type of clock which was a mahogany and five glass type of case. This is the type of case I propose to describe now. Many of you will have seen my version of the case at the Midlands Model Engineering Exhibition and also at other venues.

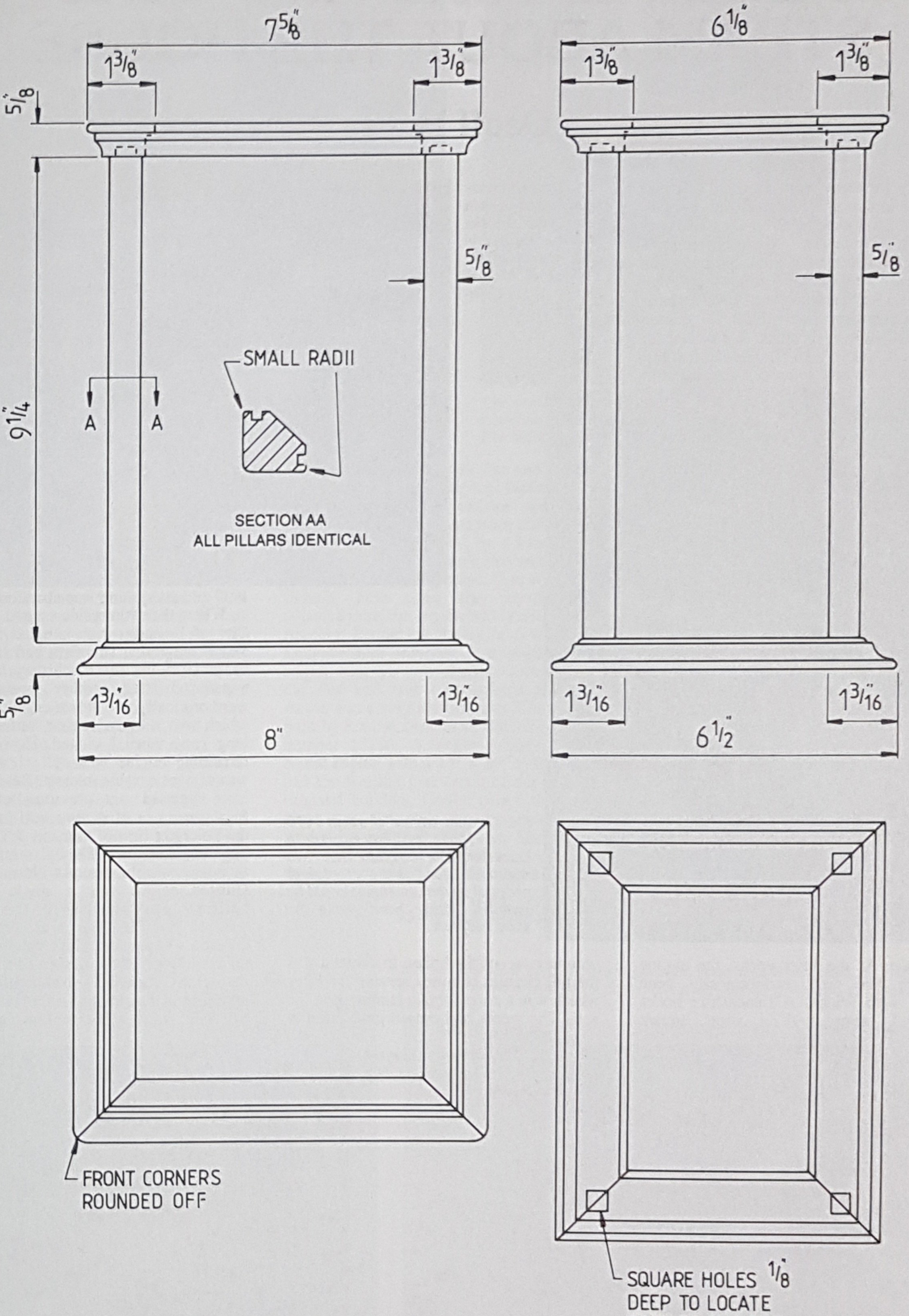
I must mention at this point that I am more at home working with metal than with wood. To the horror of some folk at the recent Midlands Woodworking & Woodturning Exhibition, I was machining wood on what they preferred to think of as a metal cutting machine. My philosophy is that if I can use my metalworking tools to create something in wood, then this is right for me. The only dedicated woodworking tools I have are a tenon saw and some chisels, some of which were ground up from discarded files. I also use a sanding disc on the portable electric drill.

The mouldings used on the upper hood or the lift off part of the case were produced with a combination of a 20mm diameter end mill to form right angle corners, a $^1/_2$" diameter ball nose slot drill to form the internal radii and a hand ground end mill to form the external radii. Even when used with great care, end mills do occasionally lose a corner and are then good candidates for a little experimentation on the 'corner of the wheel'. Producing mouldings by this method does leave a little to be desired, but some glasspaper on a block (similar to those sold with emery paper bonded to them) will soon blend the radii to a very acceptable form. The machine tools used for woodworking operate at much higher speeds than those

Continued on page 19



BASE OF CLOCK CASE

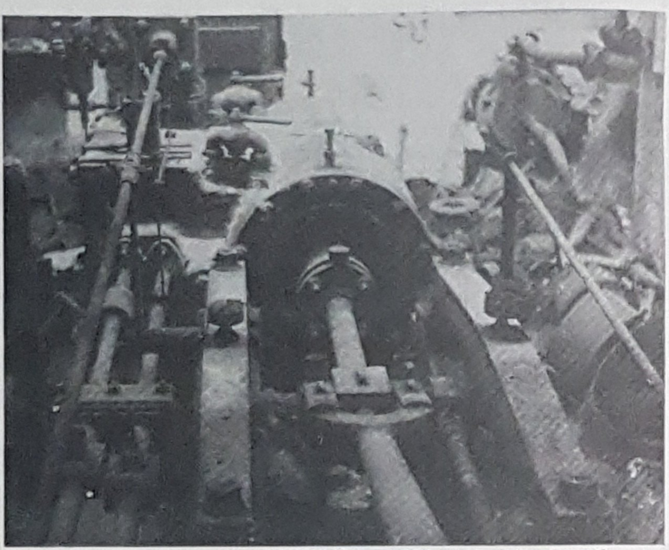


LIFT OFF HOOD

TOP OF HOOD
VIEWED FROM UNDERSIDE

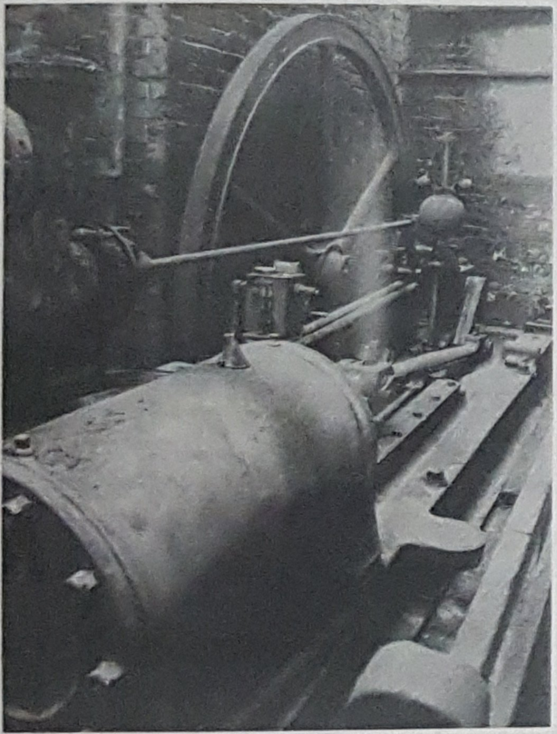
TIMBER, BRICKS AND CLAY - STEAM ABOUT THE HOUSE

Geoff Hayes



The cylinder, cross-head and twin valve rods to the Meyer expansion slide valves of the Pollock & McNab engine at the Cefn-Dy brickworks.

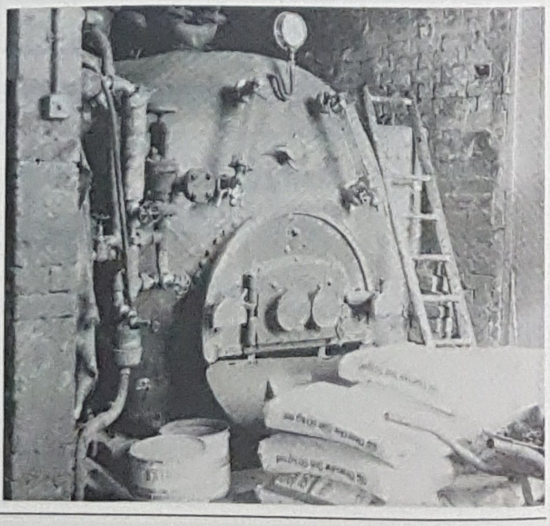
Not very far away from Trefnant and just on the southern fringe of the holiday resort of Rhyl was the Cefn-Dy ('house at the back') brickworks. My photograph of this engine is not very good but here was a larger and older single cylinder horizontal engine with the simple form of Meyer expansion slide valves. The engine had been built by Pollock & MacNab of Hyde, Cheshire in 1877. This firm made machine tools and some of these can still be found. At the brickworks, the engine cylinder had very economically been lagged with bricks! A Lancashire boiler provided steam and a short square chimney served the boiler. In contrast was the tall circular chimney serving the kilns which was a considerable landmark in the area. The works had ceased production in 1937 and everything was abandoned.



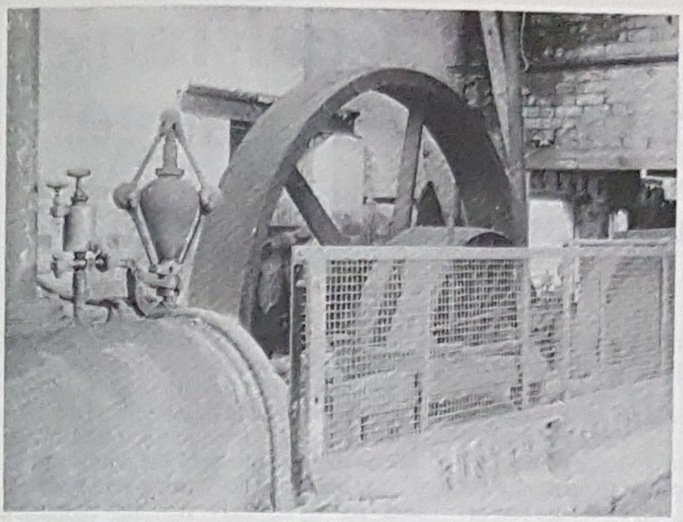
The Gimson engine of about 1870 at the New Star Brickworks in Leicester. The bedplate has two registers for the crankshaft pedestal so that an engine could be supplied 'either hand' using the same bedplate.

Where the countryside verged on to the City of Leicester was situated the New Star Brickworks. This firm had started up about 1925 but the machinery had been transferred from another works. There were originally two steam engines, one of which was a beam engine, unfortunately long gone when I visited. However, the remaining engine was still at work and was of considerable interest. Readers who have digested my previous articles in *Engineering in Miniature* will know that the Leicester firm of Gimson & Co. made large beam engines. They also made more mundane workhorses. At New Star, the Gimson engine was a single cylinder horizontal built about 1870. The cylinder was 12" × 30" and was fitted with Gimson's expansion slide valves. I have no knowledge of the design of the valves but from external examination they appeared to be similar to the Meyer type of slide valve. The valves were not

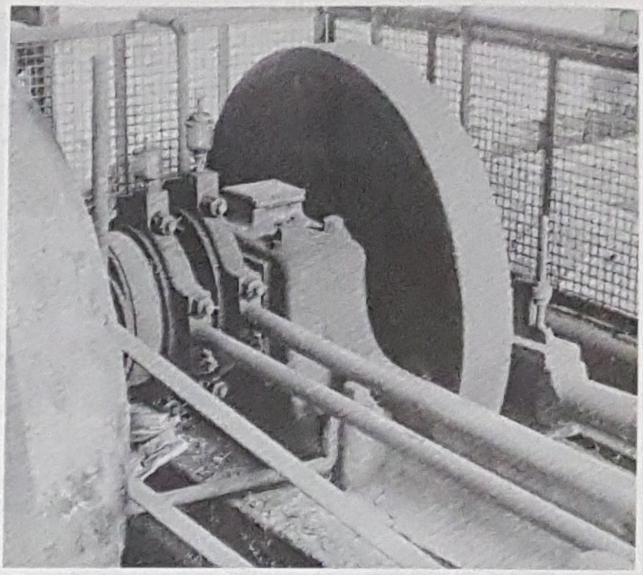
Left: The original Gimson Cornish boiler at New Star Brickworks.



Right: The dished-end Cornish boiler by John Thompson at New Star Brickworks.



Ruston, Proctor engine with Meyer expansion slide valves at Broughton Astley brickworks, Leicestershire.



The crankshaft of the Broughton Astley engine, showing the disc crank and the two eccentrics operating the expansion slide valves. The third eccentric drove the boiler feed pump.

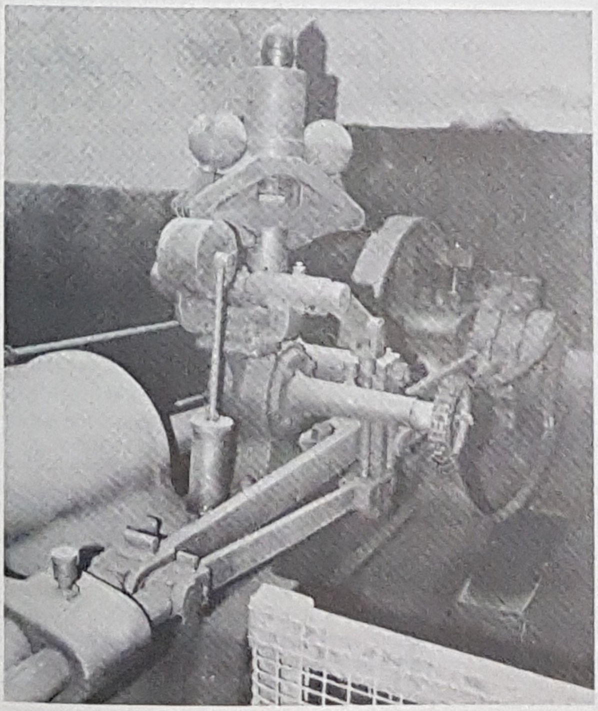
controlled by the governor, which was a variant of the Porter type. This operated a throttle valve to control the speed. The flywheel was light and large as was quite common on old engines. A belt pulley on the end of the crankshaft transmitted power to the works. Exhaust steam from the engine helped to heat the drying floors.

There were three generations of boilers at New Star. The oldest was a Cornish boiler about 5ft diameter by 12ft long. Bearing no identification, it had very likely been made by Gimson and had come to the works with the engine. Hand fired, it was fitted with a Boston Marine Patent Furnace. A second Cornish boiler was installed in 1925 made by John Thompson of Wolverhampton. This was of their dished end type and again was fitted with a Boston marine furnace. Latterly, all of the steam was supplied by a third boiler, a 'Centrax' package unit fired by an Ashwell & Nesbit underfeed stoker. The boiler and kilns were converted to liquefied petroleum gas firing about 1974 but the whole works had become derelict by 1976. The site is now covered by light industry unit factories.

Earlier in these articles we have discussed the Meyer expansion slide valve which could be adjusted by a handwheel to alter the cut-off. Indeed, this was a very popular type of slide valve. One wonders, though, how often the cut-off was adjusted once the engine was installed and running! Broughton Astley brickworks in Leicestershire provided an example of an engine with this type of slide valve. Under the dirt and rust accumulated in long disuse was a very nice engine. It had been built by Ruston, Proctor of Lincoln, works number 15786. A single cylinder horizontal engine with a 15" × 30" cylinder, it had the familiar disc crank of the east of England builders. Unlike many, the bed-plate was flat and the crosshead was guided by ordinary slide bars. There was an eccentric driven boiler feed pump and drive was transmitted to the works from a belt pulley via the familiar flat belt drive. When the brickworks was in operation, steam had been supplied by two Lancashire boilers.

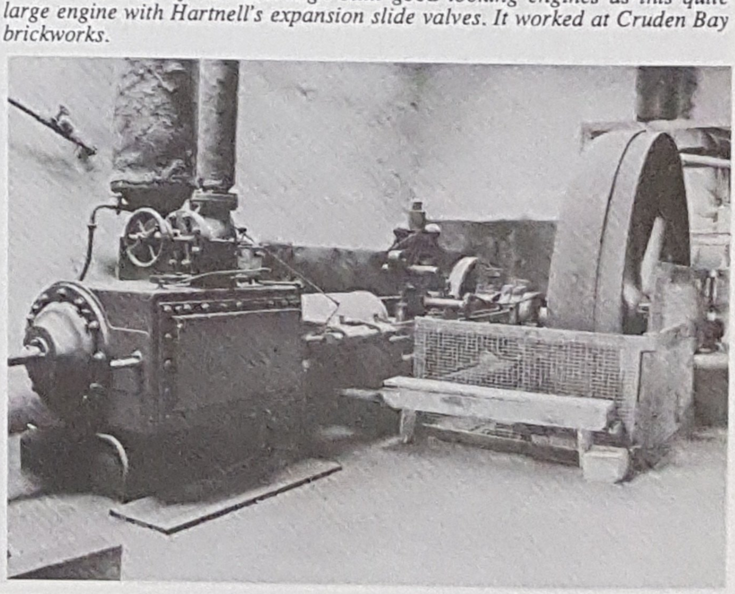
Remaining with the topic of expansion valves, Marshall of Gainsborough built many engines with Hartnell governor controlled valves. A fine example of this type of engine built in 1903, works number 38423, formerly worked at the Cruden Bay brickworks in Aberdeenshire. Of typical Marshall and east of England design, the engine had a girder or bayonet-frame bed, trunk crosshead guides and disc crank. It was quite a large single cylinder horizontal engine, approximately $17^{1}/_{2}$" × 36" and had a tailrod to the piston. The flywheel was 12 ft diameter and the drive to the works was from the flywheel via a wide flat leather belt. Exhaust steam was passed through a feedwater heater.

To be continued.



Left: Governor, expansion link and radius rod operating the expansion or riding valve on the Marshall engine at Cruden Bay.

Below: Marshall of Gainsborough built good looking engines as this quite large engine with Hartnell's expansion slide valves. It worked at Cruden Bay brickworks.



LNWR 0-6-2T 'Coal Tank' Locomotive in 5" gauge

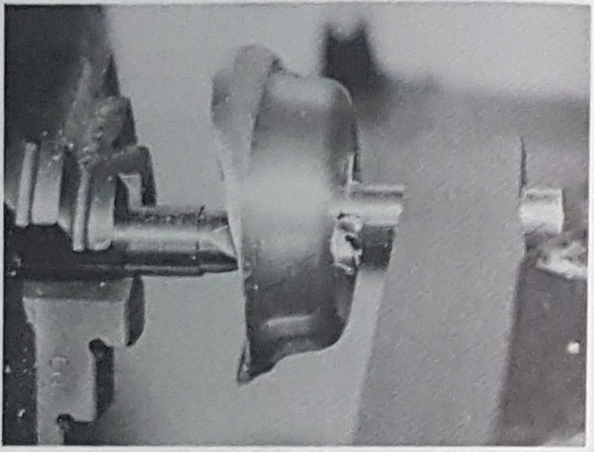
described by Hotspur

Part Forty three – The Safety Valve Casing

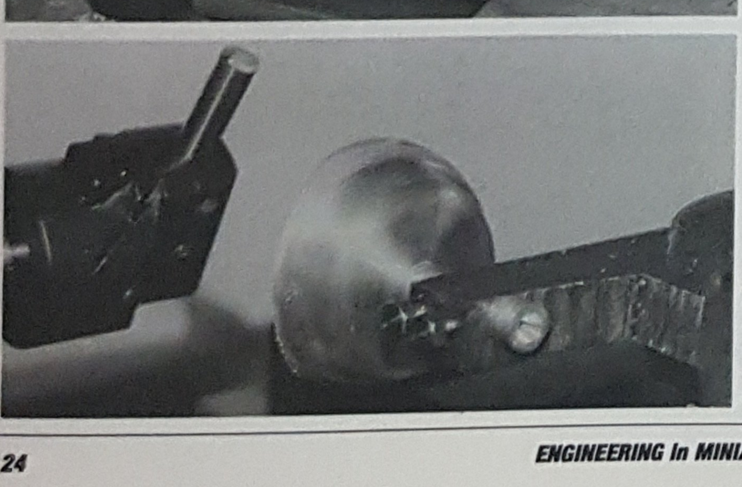
Having spent a long time describing the machining of the dome, it should be very easy for me just to say that the safety valve casing is produced in a similar way. However, there are one or two extras that I need to describe and I trust my photographs will help with the explanation.

With care the casting can be set up in the 4-jaw chuck and steadied with the tailstock centre to machine the upper radii and the chucking spigot. For those who do not like turning right up close to the chuck jaws, the lower radius can be completed as a second operation with the casting held by the newly machined spigot. With the casting reversed, put a small centre in the cast recess on the underside; this will be used later for centring purposes.

Machining the underside of the safety valve bonnet requires a different type of holding arrangement compared to the dome and it is for this reason that I have given a specific size for the turning of the chucking spigot. However, as the diameter to be flycut is the same as before, it is still necessary to set the casting to overhang to the left of the saddle, but this time it can be held by two setbolts in a reamed hole in a piece of bright mild steel bar. Use a piece about $^3/_4$" to 1" square by 6" to 7" long; which can be held under the topslide toolpost clamp. For my own holding bar, I used the end of a much larger piece of bright mild steel stock as I did not have anything smaller; it was just less convenient to handle.


Using an end mill to finish the holes for the safety valves.

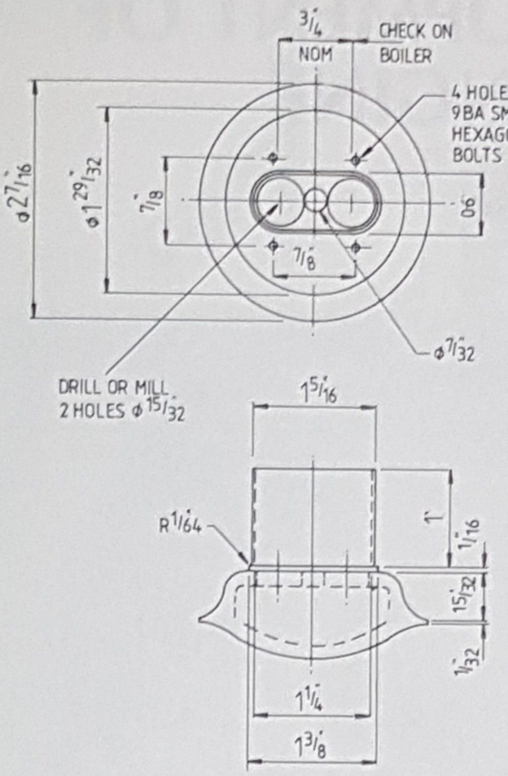
The wooden fixture made to hold the dome for fly-cutting the base.


The steel bar fixture used to hold the safety valve casing for the same operation.

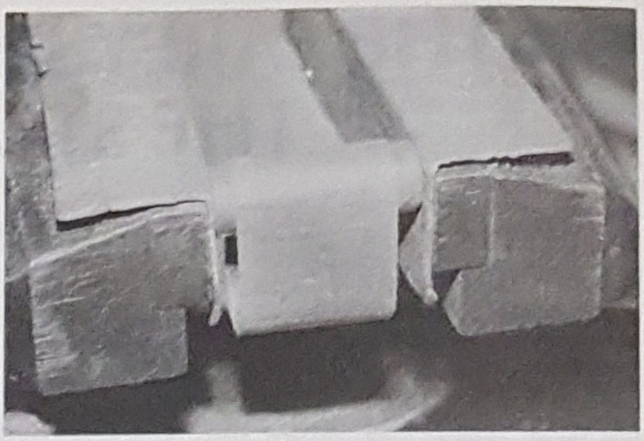
Set the bar under the clamp at right angles to the lathe axis and drill and ream a $^7/_{16}$" hole at $^5/_8$" from the left hand end. Remove the bar and drill and tap two 2BA holes about $^1/_2$" apart into the end of the bar on the centre-line of the reamed hole. Fit the spigot of the casting into the hole and set it squarely for the flycutting operation. To be sure of clamping the spigot firmly, remove it and file two flats where the bolts will seat. Now the components can be re-clamped under the toolpost with the bar in line with, but this time in front of, the lathe axis and the flycutting carried out as before. It is rather difficult to see what is going on when milling like this and I keep a small mirror handy so that I can view from a distance.

Once satisfied that the result has been achieved, there are three holes to be drilled into the recess which will be easily carried out whilst the casting is still clamped to the square bar. Two of the holes are for the safety valves but it is only necessary to drill large enough holes to clear the plain diameter of the valve bodies. These should be $^3/_4$" apart but it is easy to check their precise centres with them both fitted to the boiler. The third hole will be put into the centre when the others have been drilled and this will take the spring to hold the safety valve arm in place.

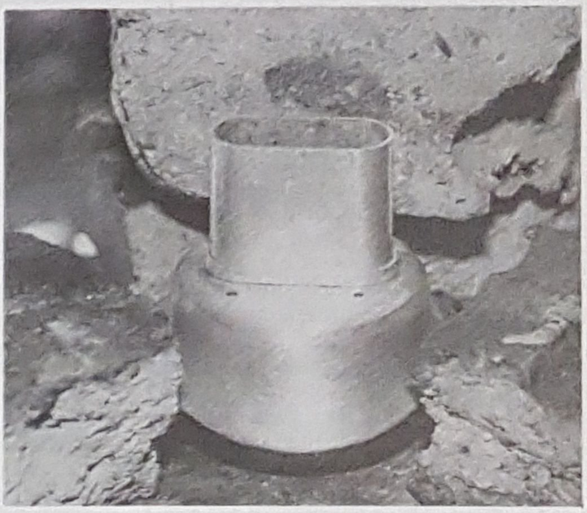
To drill these holes, reverse the casting in the holding bar so it faces the chuck and set it squarely across the lathe again. Set the centre drilling in the recess to be in line with the centre of the 3-jaw chuck. Note the reading on the cross-slide and move the casting either in or out by $^3/_8$" or whatever is needed for the actual centres of the safety valve holes. Drill the holes $^7/_{16}$" diameter until they just break through – it will not be possible to drill them any further as the spigot overlaps them and do not press too hard or the drill will snatch. To ensure there is clearance



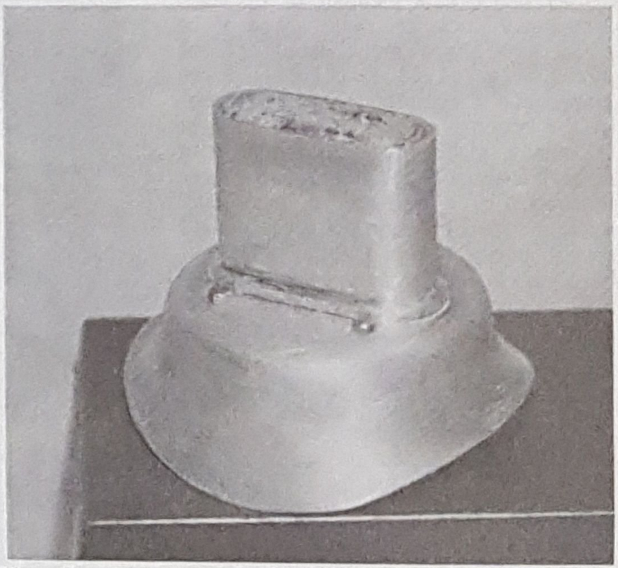
SAFETY VALVE CASING
Bronze



Top right: Forming the casing to suround the safety valves.



Above right: The top casing with the band around the base positioned on the bonnet casting ready for silver soldering. Note the holes for the dummy holding studs.



Right: The finished safety valve casing for the author's model with the band radiused and the bolts fitted.

for the valves through the cover, use a $^{15}/_{32}$" or 12mm diameter drill or endmill to open up the holes. When both are finished, return to the central position and drill a $^{7}/_{32}$" diameter hole up into the spigot. This still leaves the casting to be filed down on each side to blend the radii and finish the shaping as was done for the dome. A mixture of half round files does the trick but it is easy to slip to start with and catch your fingers on the sharp edges or damage the machined area, so patience is a virtue.

Cut off the spigot and carefully file the top of the casting so that it is flat and clean out the holes to size. To complete the bonnet, it needs the top casing which surrounds the valves to be fashioned and silver soldered into place. A look at the full size item will show that the base of this casing is radiused into a narrow step and my first thought was to make this by turning down some thick walled copper tube and then anneal it and form it to shape – a piece of copper tube $1^{1}/_{8}$" outside diameter by 16 swg, say 2" long. Turn it down to half the thickness for a length of 1" with a sharp round nosed tool and then part it off a full $1^{1}/_{16}$" long to give the height required.

However, when I came to make mine, I did not have the correct size of tube, but I found two pieces of 20 swg, the larger of which was $1^{1}/_{8}$" diameter, which would slide together. The larger one was held on a close fitting steel bar to part off a ring $^{1}/_{8}$" wide. Once annealed, it was easy to squeeze them to shape and then adjust their overall sizes or end radii over a short round bar. My photograph shows this in progress in my vice. On the prototype locomotive, this casing is also tapered towards the top on its width and length, and those with skill could achieve the taper, but some of us would make it tapered by accident and I think just producing the part to the sizes given will be difficult enough. Make the $^{1}/_{8}$" wide band to be a close fit round the base of the casing.

To silver solder these top casing parts into position, sit the casting on a round alloy block so its filed edges are not carrying any weight. Also surround the casting as far as possible with small pieces of firebrick so these fine edges will not overheat. Position the casing centrally in line with the holes then bring the parts up to a dull red heat and apply the silver solder sparingly. Clean up the assembly and check it for accuracy before setting it up in a tilting vice to add a radius to the top edge of the band to simulate the radius over half its width. If this is done at 45 degrees or so on both sides with a ball end milling cutter about $^{3}/_{16}$" in diameter, the two grooves can be run on around the ends with a small round file.

To end, my drawing shows the position of the four holding bolts fitted to the full size locomotive to attach the casing to the inner valve plate. For our model these will only be 9BA dummies, fitted as hexagon bolts with nuts into plain holes from either direction. My final photograph shows these as studs, so they can be put in from underneath, but my reference drawing indicates they are bolts, so builders can choose.

Next time I hope to be able to start on the bunker and side tanks.

To be continued.

THE EARLY DEVELOPMENT OF THE STEAM ENGINE

by David Hulse

Part Twenty-one

The Oldest Surviving Engine House?

The model of Thomas Newcomen's engine was completed by October 1987 and, after spending so much time in the research and construction, I was very pleased to be able to display this engine for the first time at the 1987 Midlands Model Engineering Exhibition, where it was awarded first prize and also the Modelcraft Cup. After this initial showing, the model was taken to the model engineering exhibition held in London. The model was again successful, gaining the first prize and a gold medal. From this exhibition, the model attracted the attention of the presenters of BBC Television's 'Blue Peter' programme, with the result that the model was shown working on the show on 14th January 1988. Great interest was shown nationwide, but the correspondence that proved the most interesting was from Mr James Boyle of Ardrossan, Ayrshire.

Mr Boyle is a member of his local Museum Association, who asked if he could have some more details of the model. He asked if I could supply photographs and a comprehensive description of the original engine because he was organising, at his Museum, a display of colliery machinery centred around a large illustration of a well-known local landmark, a ruined building that once housed a mine pumping engine thought to have been built in 1719 to draw water from the mine workings of a colliery at Stevenston, Saltcoats, Ayrshire. The photograph, figure 77, shows how the early atmospheric engine house appeared about 1938.

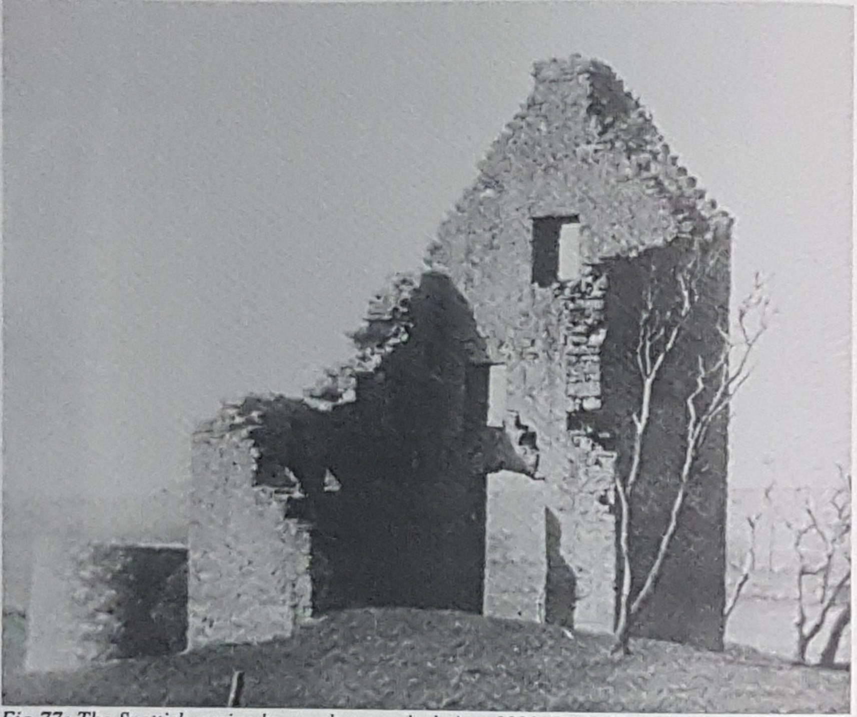


Fig 77: The Scottish engine house photographed circa 1938. By kind permission of Saltcoats Museum.

It was not until these early engines were being described in detail and in chronological order that the date of 1719 became of some importance. If this could be proven to be the age of the ruined building, then we are looking at the oldest surviving relic of a Newcomen engine house in the world!

At this stage, the Newcomen Society were asked for their opinion of this relic and, on seeing the photograph, gave credence to this being a very early atmospheric engine house indeed. But could the date of 1719 be proved? The only written evidence to be found was from a report entitled *Excerpt from Burgh of Saltcoats Quarter Centenary 1528–1928*, which states the engine house was erected in 1719 by the Saltcoats Shipmasters, lessees of the colliery and saltpans.

The engine was installed for the pumping of water out of the pits and was stated to be the second engine set up in Scotland. The report further states that the site of the engine house was close to the course of the canal which was built to transport the coal from the colliery to Saltcoats harbour for shipment. The canal was completed on 19th September 1772.

At this juncture, Historic Scotland was contacted and John Hume was willing to try and authenticate the date of 1719. John has written on industrial archaeology in Scotland and seemed very interested in this project. He even said that Historic Scotland was willing to carry out an archaeological dig if documented evidence was not forthcoming. Unfortunately, no new evidence has been found, but Historic Scotland is quietly confident that the date of 1719 is the correct one and this ruin was built to house the first Newcomen engine ever assembled in Scotland. The second engine to be built in Scotland was at Elphinston Pit, Tranent, East Lothian in 1720.

What is Known?

The only reference to an engine assembled at the Stevenston Colliery in 1719 is in *The Steam Engine of Thomas Newcomen* by Rolt and Allen, where they mention that the engine was originally built by Peter Walker and John Potter and had a powering cylinder of 18" in diameter. This was cast in iron and is generally thought to be the twentieth engine built after the original Dudley Castle engine of 1712.

The Engine House Today (1996)

The engine house remains are situated on what is now Auchenharvie Golf Course, easily found between Stevenston and Saltcoats. Many of the detailed features are now lost from the historic photograph, figure 77, as the building has been consolidated to prevent any further decay. Sadly, it is not now easily recognised as the building that once housed such an important engine.

On a recent visit to photograph and measure the engine house, I was often asked why anyone should be measuring the remains of this building. The local children thought it was the remains of a Scottish castle! The standing walls are built from random sandstone, interspersed with large blocks of granite.

After sketching and taking most of the main dimensions, a conclusion was reached that this relic had originally housed an atmospheric pumping engine, the dimensions indicating that it was built to hold a very small engine. The dimensions show that the whole installation was much smaller than the engine built by

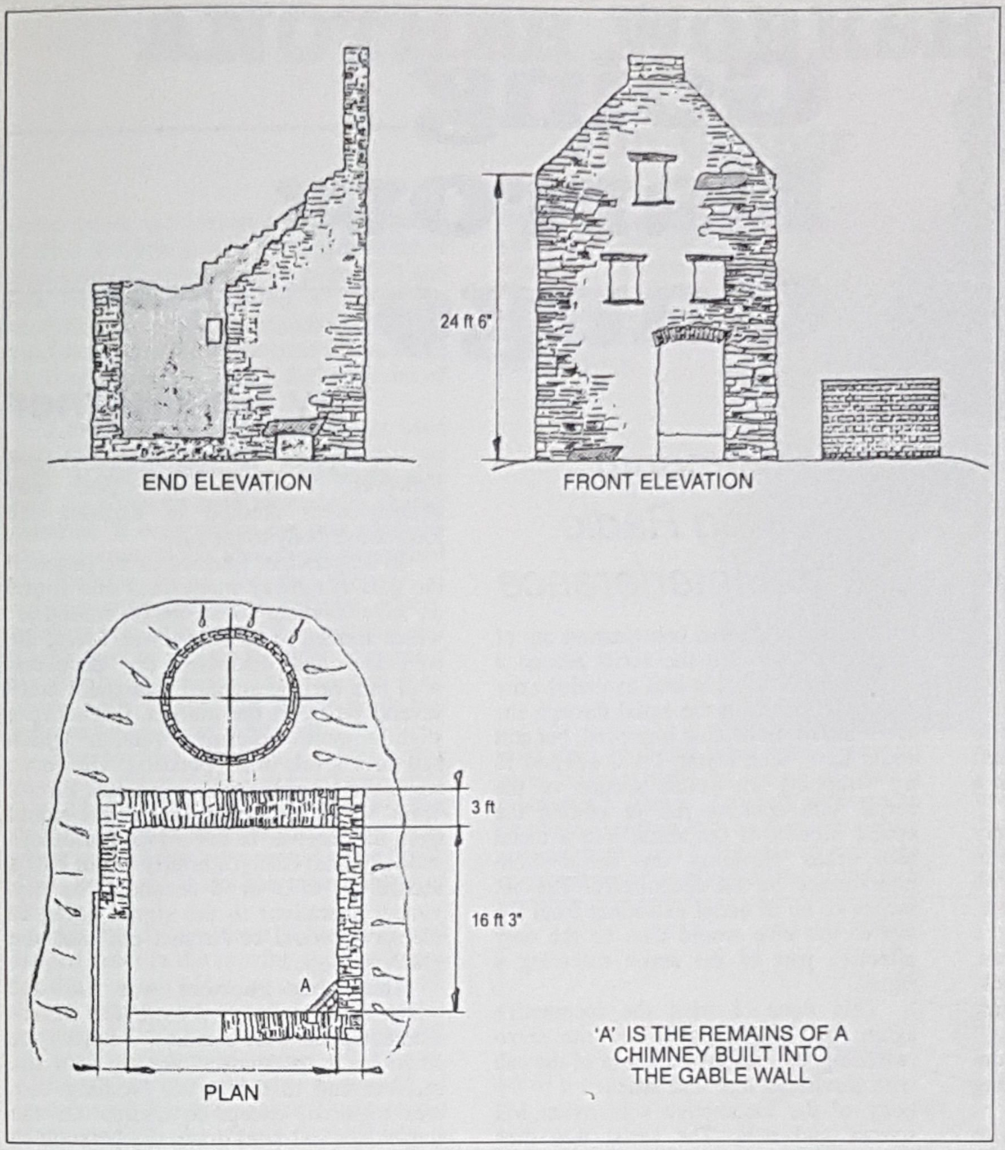


Fig 78: A sketch showing the dimensions of the building taken from measurements of the remains of the building and from the early photograph in Saltcoats Museum.

Thomas Newcomen at Tipton. A drawing showing the dimensions of the building is shown as Figure 78.

A close study of the original photograph, together with a detailed study of the building's features, reveals this to be a most unusual installation because, when this engine was working, the great overhead rocking beam did not pivot within the end gable wall, but passed through and pivoted on one of the adjoining side walls. The evidence to substantiate this theory is that the wall on the left-hand side of the photograph is almost 12" thicker than the three remaining walls. The accepted practice was for the great overhead rocking beam to be supported, and pivot through, one of the end gable walls, but on this early atmospheric engine house, the standing gable wall was the narrowest of the whole building! Conclusive evidence that this was so can be seen in figure 77 showing the round structure of the original well head adjacent to the side wall.

Proof that the beam was supported on the side wall can also be seen by two window-like openings. In the early eighteenth century, these openings supported the great sommer beams which held the powering cylinder in the vertical working position and, by some careful measurements, they reveal that these beams were about 20" apart. This measurement would allow the 18" diameter cylinder to be held firmly in the vertical position with long nuts and bolts. This would suggest that the structure was the original building of 1719 and not a later construction, as the early eighteenth century pumping installations were only superseded by engines using larger cylinders (which was considered at that period the only way of increasing the engine's power), and the Scottish building could not have accommodated an engine with a larger cylinder.

From the written facts and dimensional evidence, it appears that the building on the Auchenharvie Golf Course did hold the first Newcomen atmospheric engine in Scotland. It is hoped that the remains of this building have continued protection and a plaque stating it to be the oldest surviving structure that once held a steam engine, pumping water from mine workings at the Stevenston Colliery will be fitted.

In Sweden, the building that once housed the first Newcomen engine constructed by Marten Triewald in 1728 still survives at Dannemora, and was considered to be the oldest building ever to have contained a steam pumping engine, but now all the available evidence suggests that the Scottish relic predates the Dannemora engine by nine years, so the Scottish structure is by far the oldest surviving building to have housed an atmospheric pumping engine.

To be continued.

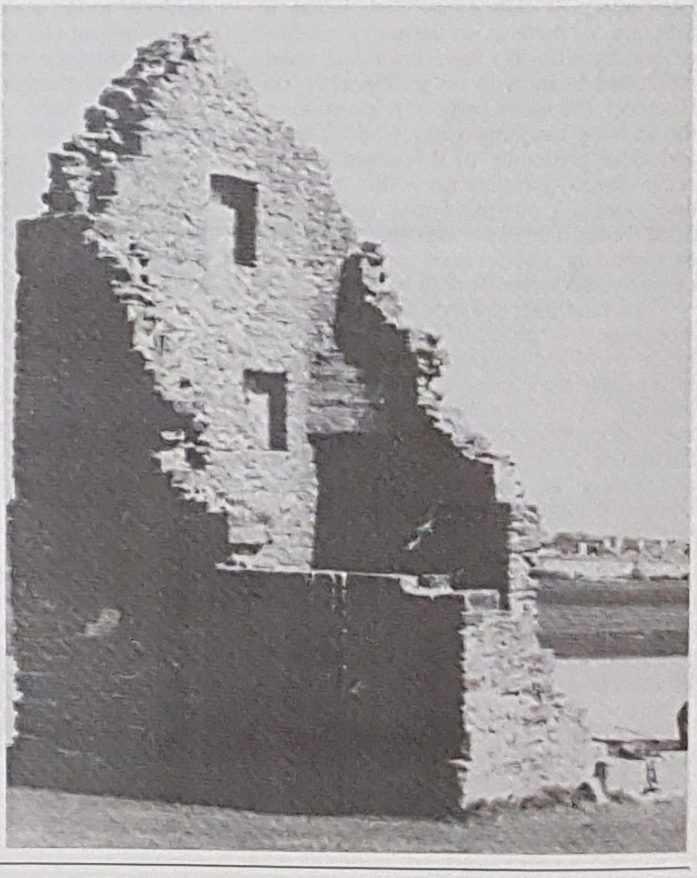
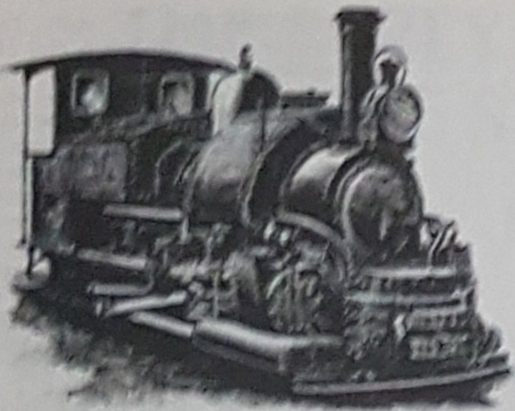


Fig. 79: The engine house as seen in 1996 on Auchenharvie Golf Course. The well head has been filled in and the surrounding walls dismantled.



Going Narrow Gauge

by Southerner

This month: Solving Radio Control Interference

As my 16mm/ft model of the Lynton & Barnstaple 2-6-2 tank locomotive 'Lew' uses only one channel of a radio control transmitter for both speed and direction, I could use the transmitter's second channel to control something else. I settled on a radio-controlled diesel outline battery electric locomotive which could use a resistance type speed/direction control board such as those used in electric model boats. This would mean that I would have to purchase only a second receiver and 40MHz crystal of the same channel frequency as used on 'Lew', rather than a whole radio control outfit!

The installation of the small battery pack, receiver and servo/speed control board did not cause any problems; the cab of the locomotive is made of steel plate, so the aerial was threaded through a window aperture for the engine's first run. The locomotive was placed on the track, the receiver switched on and almost immediately the servo began 'twitching', with the receiver responding to random radio interference and sending conflicting impulses down the leads to the servo.

The problem with solving radio interference is that every installation is different, so there is no definitive method of dealing with it. I have built four radio controlled boats with no problems at all! However, the metal body of a locomotive, the moving coupling rods, wheels, track and close proximity of the motor can all cause radio interference. The solution upon which I stumbled may not be the ideal solution for another modeller experiencing interference, nor the most effective, but it has worked for me.

The first step towards controlling the interference – 'glitches' is the name given to the wayward interference spikes – was to suppress the motor. The most effective method is to connect a suppressor between each of the motor terminals and the motor casing, but a slightly cheaper, and nearly as effective method, is to connect a suppressor between each motor terminal.

The glitches still occurred, especially if the transmitter aerial was not extended fully and when I was standing well away from the locomotive. This pointed to reception problems, so I fastened the tip of the receiver aerial to a thin wooden dowel, fixed temporarily to the locomotive cab side. Reception improved, although the look of the locomotive was just awful! Obviously, the aerial would have to go, and yet still be effective.

To simply cut the aerial wire would put the receiver/aerial combination out of balance, so I coiled the aerial around a small wooden bobbin and extended only about six inches of the aerial through the cab window. Reception improved, but still could have been better. I was advised to try wrapping the coiled section of the aerial with cooking foil or putting the coiled section of the aerial into a metal tube, thus shielding the aerial from interference on the locomotive. The six inches or so of aerial extending from the top of the tube would then be the only effective part of the aerial receiving a signal.

This done, I tried the locomotive again, but glitches still sent the servo twitching, so I isolated the roof of the cab with insulation tape and fastened it to the body of the locomotive with nylon M2 screws and nuts. The aerial was then soldered to the underside of the roof. The improvement was quite dramatic – I could control the locomotive from quite a long way away, though a few glitches still tended to make the progress of the locomotive rather jerky in places, especially over points and track joints.

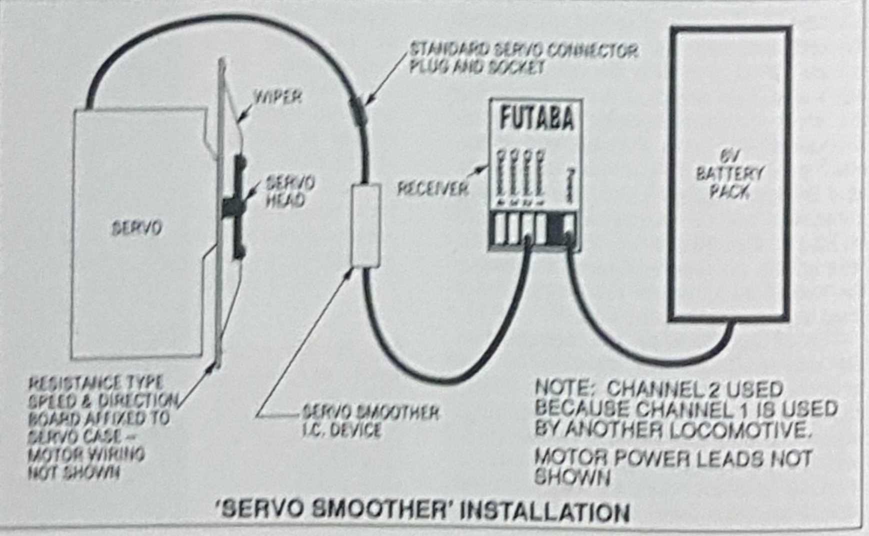
The locomotive did not have sprung axles, nor any compensation which would keep all the wheels on the track, and the intermittent lifting of at least one wheel, even just slightly, was obviously still causing spikes of radio interference. However, I could not find any inconspicuous method of earthing the locomotive body to the rail.

In desperation, I turned to the pages of the garden railway magazines and found an advertisement for a 'servo smoother' which seemed to be the answer. I rang the advertiser and discussed my problems with him and he advised that there were several types on the market, including a slightly more expensive version which had three levels of suppression. The servo smoother consists of an integrated circuit 'chip' which intercepts the control signal from the receiver to the servo and delays sudden signal changes briefly (from half a second up to 3 or 4 seconds), so that violent alterations to the signal going to the servo would be 'ironed out' and the glitches stopped.

This latter smoother was the one which I eventually purchased. The device was equipped with standard Futaba type servo leads to connect directly into the receiver and to the servo. Nothing else was required, except to switch on the transmitter and hold down the joystick to give the required amount of suppression when the receiver was switched on.

The result was absolutely wonderful – the locomotive responded to the transmitter signal almost instantaneously, and the few 'glitches' were eliminated completely!

For metal locomotives with problems of radio interference affecting the signal to the receiver, the servo smoother, in any of its variations, is a real boon and I thoroughly recommend it.


STANDARD SERVO CONNECTOR PLUG AND SOCKET
WIPER
FUTABA
SERVO HEAD
RECEIVER
6V BATTERY PACK
SERVO
RESISTANCE TYPE SPEED & DIRECTION BOARD AFFIXED TO SERVO CASE – MOTOR WIRING NOT SHOWN
SERVO SMOOTHER I.C. DEVICE

NOTE: CHANNEL 2 USED BECAUSE CHANNEL 1 IS USED BY ANOTHER LOCOMOTIVE.

MOTOR POWER LEADS NOT SHOWN

'SERVO SMOOTHER' INSTALLATION

ANOTHER WORKSHOP TIP

Jim Canner

Some while ago I wrote a little description of five workshop tips for *Engineering in Miniature* (December 1994, page 197) and one of them related to a couple of modifications to a standard Myford machine vice. Since that time I have made another change which I feel may be of interest to our readers.

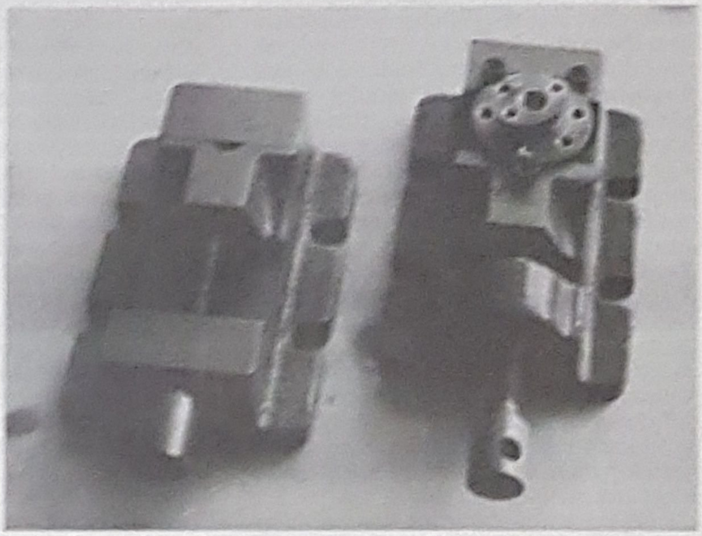
I had been looking at the Proops hand vice which uses a moulded pair of jaws with a matrix of holes into which pins may be fitted to hold awkwardly shaped material. It occurred to me that a similar arrangement of the idea could be applied to machine vices for the purpose of holding such things as cylinder covers, washers, etc that are of thin material and which tend to run up the drill or cutter if not firmly held down. This can, and does, cause both minor and major workshop injuries when the vice lets go!

The Myford vice has a semi-circular groove in the moving jaw to take a swivel jaw. This groove is an advantage when drilling close to an edge and in my view, every vice of this type should so be fitted. This, however, is not the main subject of this tip.

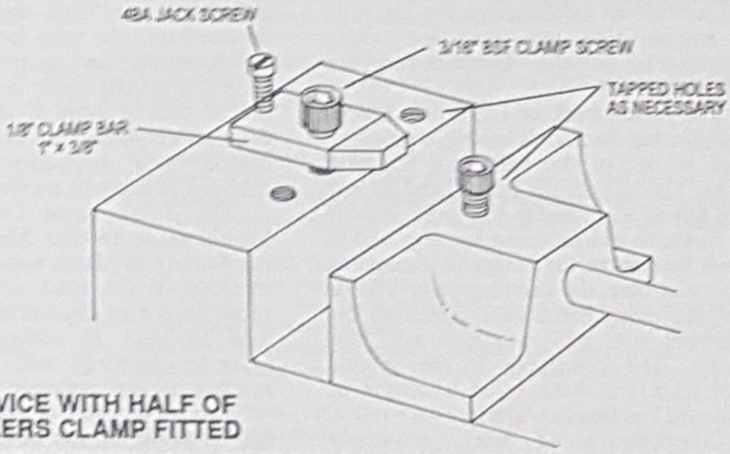
All that I have done is to put several tapped holes in the moving and fixed jaws for the purpose of taking cap head screws. These screws are tough and the centre portion of the head has a fine spline which is ideal to supply some extra grip. Although I did not do it myself, I recommend that these screw heads, on the plain portion, be fitted snugly into a counterbore at the threaded holes. This will make for better security. To hold round objects, only three screws are required and this will probably suffice for most work. My screws were $^{3}/_{16}$" BSF.

Having done this job, you might like to consider using the screws in another mode. Figure 1 shows a little clamp bar, of which three or four can be made from mild steel, to clamp those other awkward parts that we make by means of 'half a toolmaker's clamp'. The jack screws can be much less than $^{3}/_{16}$" as they are lightly compression loaded. The use of cap head screws makes finger tightening of the jack screws very easy!

It is also possible that this tip can be used if the vice is mounted on the lathe faceplate to hold those items which so often seem to slip in the more conventional chuck.



Before and after conversion of the Myford machine vice, with the vice at right holding a cylinder end cover for machining.



TYPICAL VICE WITH HALF OF TOOLMAKERS CLAMP FITTED

Readers' Letters . . . Hints & Tips

Continued from page 32

Dear Sir

I refer to Jim Canner's letter in the June 1997 edition of *Engineering in Miniature* on the subject of carbide tooling.

We are regularly invited to talk to model engineering societies and repeatedly answer the same questions. We hope that our explanations will help to clarify some of the main points.

Q: I have been given a tool from a friend in industry – why does it not perform well on my Myford ML7 lathe?

A: Lightly spindled, low-powered lathes need sharp edged, positive top rake tools. These use far less power and are much less prone to vibration and built-up edge than their negative rake industrial cousins.

Q: I regularly need to take very small finishing cuts, sometimes down to 0.0005". How can I do that with carbide inserts?

A: Positive top rake, together with peripherally ground inserts without edge-rounding will enable such cuts to be taken without push-off. However, to stop rapid breakdown of the cutting edge, a fine grained, wear-resistant carbide grade like our NJ17 or H13A needs to be used.

Q: Do I need to use coolant with indexable carbide inserts?

A: Coolant is not needed; however, when turning soft steels and aluminium, it is often beneficial to apply a light coating of cutting oil to help reduce built-up edge.

Q: When taking heavy or intermittent cuts, I find that my titanium carbide (Cermet) inserts break down very easily. What am I doing wrong?

A: Cermets are not designed for heavy or intermittent cuts. They are too brittle for these applications. The simple solution is to use a tough tungsten carbide grade.

Q: What is the difference between H13A and NJ17?

A: H13A is a tough, all round tungsten carbide grade with good wear resistance. NJ17 is our latest innovation for model engineers, combining great toughness with an even greater level of wear resistance. It is also much less prone to built-up edge and therefore gives better surface finishes on soft steels and stainless steels.

For more detailed information on the subject, your readers may call us on (01527) 877576.

Darren Maggs, Greenwood Tools
Worcestershire

CLUB NEWSROUND

Following intensive efforts by Alan Gildersleve and the Sunday work parties over the past few months, the triangle of the ground level track of **Bedford Model Engineering Society** is nearing completion. Thoughts are now turning to improvements to the raised track and signalling. The steaming bays also need to be installed permanently.

Easter saw the start of the **Bournemouth & District Society of Model Engineers** running season at Kings Park, Bournemouth and the appearance of a new locomotive built by Mike Crofts to Don Young's 'E S Cox' design. This model should be a good performer. The weekend of April 12th-13th was the official opening of the 7¼" gauge ground level track and the 35th anniversary of the opening of the raised track. The club also staged an exhibition.

Eight train detectors have been installed level with the top of the rail in the **Bracknell Railway Society's** track at Jocks Lane as part of the new signalling system, To protect the detectors from damage, a gauge block of the same shape has been installed between the traverser and the departure platform. The gauge will provide an indication to the driver of an engine with any very low slung components, possibly by removing the offending item!

The raised track of **Bradford Model Engineering Society** is having continuing work to secure the rails and maintain gauge. The station has been tidied up and it is hoped to continue the work around the turntable and steaming bay legs and to repair fencing to the bridge. Although an unpopular task, the painting party will be applying more Brunswick Green to the steelwork and will welcome any new recruits. The pointwork to the ground level track has been oiled a couple of times and has freed up nicely.

Consolidation of work previously undertaken seems to be part of the activities of members of **Cheltenham Society of Model Engineers** at present. Foundatons for the station platform have been dug out and practically all of the hardcore and rubble from the works corner have been 'lost' into the ensuing hole. The soil removed has been used to fill in alongside the ground level ballast. This soil has been seeded so it should not be too long before the club has a nice covering of grass.

The signalling control box for the **Durban Society of Model Engineers** has been refitted in the Committee Room by Eric Lupke after being altered to suit the club's one-way running and reduced number of signals circuits. A new transformer has also been fitted. The signal posts have been cemented in position around the track by Dave Rose.

The recent **Frimley & Ascot Locomotive Club** Open Weekend in June gave members the opportunity to try out their recently introduced avoiding line which allows through running when the station platforms are occupied. Opened in 1991, the 3½"/5"/7¼" gauge ground level half-mile miniature railway in Frimley Lodge Park, Sturt Road, Frimley Green, Surrey, has been developed over the past six years and has a fully automatic three-aspect colour signalling system. Operations start at 10.00am each day. Further information may be obtained from Peter Gardner, telephone 01252 541999 (weekdays between 7.00-9.00pm).

When railway operations started at Easter, members of **Harrow and Wembley Society of Model Engineers** were working hard to complete a thorough overhaul of the sleepers, points and turntable for this season. Sections of the track were lifted for refurbishment in the carriage shed, while safety work included the fabrication of a spectator barrier around the steaming bays and stabilizing the station railings.

Members of the **Heat Engine Association of Nova Scotia** made the most of an opportunity to have their welding related questions answered and/or demonstrated by a highly qualified expert recently. First, the large group of amateur welders in the club were shown and demonstrated the wire feed MIG welder before trying the equipment for themselves. A plasma cutter was then demonstrated cutting some 6" diameter by ¼" thick steel plates, before the day concluded with instruction and demonstrations of using an arc welder.

The Track Open Day of **Melton Mowbray & District Model Engineering Society** in March was one of the best meetings at the track site. There were about seventeen engines of both rail and road varieties in attendance and the *Leicester Mercury* and *Melton Times* newspapers gave coverage to the event.

There has been much progress with the turntable for the new track spur of **Milton Keynes Model Engineering Society.** In March the turntable itself was transported to the site and lowered on to the pivot. The foundation pit for the turntable retaining wall was then dug using the turntable as a guide and the concrete poured, with the top of the foundations smoothed off with a float ready to support the outer wheels of the turntable. As a bonus, the station platform at Lodge Pool was also completed with the same batch of concrete. The final stretch of track bed leading to the turntable has been ballasted, while the headshunt, which was lifted to allow the station building to be installed, has been reinstated.

Much work by members of the **Model Engineers Society of Northern Ireland** has resulted in a superb raised track after the somewhat warped and damaged steel rails were replaced by alloy rail, so anti-clockwise get-aways from the steaming bays should now be free of slipping in all kinds of weather. The wheel profiles and bogie swing of the ground level track passenger trucks has been improved, which will considerably reduce wear on the ground level track. Attention is now turning to the perimeter fencing which is in need of urgent attention in several places.

A superb annual club model exhibition is being planned by members of **North London Society of Model Engineers** to be held at Barnet College, Wood Street, Barnet, Hertfordshire on the 27th-28th September from 10.30am. All the sections of the club will be exhibiting their models, filling the college hall and the gymnasium, while in the grounds outside, both the ground level and raised portable tracks will be in operation, while the portable boating pool will allow model boats to be demonstrated. One member will be exhibiting his full size steam road roller and his steam launch. The exhibition is readily accessible by public transport and there is good car parking nearby.

The 'Tuesday Gang' of **Norwich and District Society of Model Engineers** have now completed laying the track with flat bottomed rail and the track is available for use. However, there is always something to be done to improve the club's facilities. Volunteers usually bring sandwiches for lunch, but tea or coffee is provided and the hut is heated to provide some comfort during the breaks!

Members of **Perth Society of Model and Experimental Engineers** were kept busy right up to Easter to complete their raised track. A working party visited Kincardine Power station to collect some redundant sleepers which were then sectioned and set in the ground to form a base upon which to set the remaining sections of track.

The annual Models Competition held by members of **Rochdale Society of Model & Experimental Engineers** on 7th March was very well attended. The models on display included various stationary engines, boilers and locomotives in both 3½" and 5" gauges. Also on display was a superbly detailed model of a London Electric Tramways stores tram in 7¼" gauge. Cups were awarded to Don Allen for his Class 40 diesel locomotive and to Brian Cotterell for his Hunslet locomotive, completed in just eighteen months!

The old Nissen hut on the Rolfe Lane tracksite of **Romney Marsh Model Engineering Society** has been rebuilt and now has mains electricity connected. With brand new concrete walls and flooring, it is being used as a small storage building for tools and materials. When renovated, the black shed will be used to house the club trolleys and then the clubhouse will be demolished. If and when mains drainage comes to the area, it may be possible to construct proper toilets on the rear of the new building.

Regretfully, the committee of **South Cheshire Model Engineering Society** had to reject an application for permission to run on the old raised track which is not fitted with an anti-tipping rail. However, the committee is prepared to facilitate any offer by members to install such a rail on the old track to the same design as that used on the new, larger track.

With the last of the passenger trolleys now fitted with vacuum brakes, members of **Staines Society of Model Engineers** now have six fully fitted vehicles. The society has a portable vacuum pump rig for testing the trolleys before use. So far, there are eight locomotives fitted with a vacuum ejector and only locomotives so fitted are permitted to pull passengers.

Members of the **Steam Locomotive Society of Victoria** held their Kindred Societies Invitation Run over the weekend of 17th/18th May. The weekend had as its theme the 'Great Sweet Pea and Blowfly Rally' as these two locomotives must be the most popular beginners' designs of recent years.

The driving trolleys of **Tonbridge Model Engineering Society** were extensively overhauled during the winter months with new brake cables and pads which have to bed in. Members are rotating the trolleys so as to even out the wear on them. The society committee has decided to name two trolleys 'Jack Mercer' and 'Bud Annison' in memory of all the work done by Jack and Bud over the years.

Visitors to the **Toronto Live Steamers'** track at Humes Auction Farm, 4th Line Road, north east of Milton Ontario, about 30km west of Toronto, 1km north of Highway 401, are always welcome if they contact the secretary, Jim Lee, telephone (905) 451-1450, beforehand. The second Sunday of each month has been chosen as the club's steaming day because of less conflict with public holiday weekends. Last season the installation of a fourth rail to the track was completed and the club can now welcome 2½" gauge locomotives.

It appears that the proposed road project threatening the tracksite of the **Vancouver Island Model Engineers** will not now be started this year. However, this only makes the anticipation more painful. The steaming bays are in serious need of work, but members cannot plan their new location until the road scheme is settled. Meanwhile, members have been investigating building a new loop around the outside of the north loop of the present track. This would involve some 2 percent grades and a tunnel as well as trestle or bridge work, but would make a very challenging circuit, though it may compromise the planned 60 ft minimum radius.

Members of **West Wiltshire Society of Model Engineers** meet on the first and third Wednesday of every month at their 3½"/5" raised track at Queens Road, Westbury, Wiltshire. The club has a new chairman, Terry Haggerty, a new vice chairman, Graham Cowmeadow, and a new secretary, Mark Burgess, telephone 01380 725680. The committee members are working on a new set of track operating rules which it is hoped will be in force for this year's running season.

The monthly meetings of members of **Wigan & District Model Engineering Society** are now being held at their new venue, the Moorland Centre, Wood Street, off Chapel Street, Wigan, at the rear of the old AEEU offices, on the last Tuesday of each month. The work on the steaming bays is just about finished – it really has been a major civil engineering effort – but the end results will enhance what is recognised already as a superb running track. Next year's work programme is much more modest, but it is intended to split the track for a 'Mark II' traverser to allow an assembled train to drive directly on to the track.

Diary July

Details for inclusion in this diary must be received **at least** EIGHT weeks prior to publication. Please ensure that full information is given, including the *full address* of where every event is being held. Whilst every possible care is taken in compiling this diary, we cannot accept responsibility for any errors.

EVENTS OF INTEREST TO MODEL ENGINEERS

A comprehensive list of steam rallies and other preservation events can be found in the *Steam Heritage Museums and Rally Guide 1997/8*, available from TEE Publishing, price £3.50 including postage.

1	Guildford MES, Members Running Day, Stoke Park, Guildford, Surrey.
2	Chingford & District MEC, Rummage Sale, Ridgeway Park, Chingford, London.
2	Hull & District SMEE, Competition for the Shep and Watson Trophies, West Park, Anlaby Road, Hull, North Humberside.
3	Sutton MEC, Bits & Pieces Evening, rear of 1 Chatham Close, Sutton, Surrey.
4	Maidstone MES, Evening Run, Clubhouse, Mote Park, Maidstone, Kent.
4	North Norfolk MEC, 'Loctite Adhesives', Social Centre, Avenue Road, High Kelling, Holt, Norfolk.
4	Rochdale SMEE, 'Class 45 in 5" Gauge', Talk by Don Allen, Castleton Community Centre, Manchester Road, Castleton, Rochdale, Lancs.
5	Leyland SME, A Traction Attraction down at the Park, Worden Park, Leyland, Lancashire.
5	SMEE, 'Chemicals in Engineering', Talk by Alistair Spencer, Marshall House, 28 Wanless Road, London SE24.
5	West Wiltshire SME, Great Bulkington Railway/Bulkington Village Fete, Millcroft, Mill Lane, Bulkington, Devizes, Wiltshire.
5/6	Chiltern TEC, Steam Rally, The Hangings, Prestwood, near Great Missenden, Buckinghamshire.
5/6	MSRVS, Annual Rally, Tewkesbury Rugby Club, Ganders Lane, Tewkesbury, Gloucestershire.
6	Cambridge MES, Maxitrak Rally, Fulbrooke Road, off Grantchester Road, Cambridge.
6	Stafford & District MES, Working Party, County Showground, Weston Road, Stafford.
7	Peterborough SME, Bits & Pieces Evening, Thorpe Hall, Longthorpe, Peterborough, Cambs.
9	Norwich & District SME, AGM, Angel Road Middle School, Angel Road, Norwich, Norfolk.
9	St Albans & District MES, Questions and Answer Night, Christchurch Hall, High Oaks, St Albans, Hertfordshire.
10	High Wycombe MEC, Track Evening, Holmer Green Sports Association, High Wycombe, Buckinghamshire.
10	Leyland SME, 'Just a Chat' evening, The Conservative Club, Towngate, Leyland, Lancashire.
10	North West Leicester MES, 'Walschaerts Valve Gear', Talk by Mr John Walker, Coalville Labour Club, Bridge Road, Coalville, Leicestershire.
10	Sutton MEC, New Drivers Run, rear of 1 Chatham Close, Sutton, Surrey.
12/13	Gauge One Model Railway Association, Golden Jubilee Exhibition, Warwickshire Exhibition Centre, The Fosse, Fosse Way (on the junction of the A425/B4455), Leamington Spa, Warwickshire.
12/13	Llanelli & District SME, IMLEC 1997, Pembrey Country Park, near Llanelli, South Wales.
13	Sutton MEC, Track Day and Summer Barbecue, Chatham Close, Sutton, Surrey.
13	Tonbridge MES, Fly Shunting Competition, The Slade, Tonbridge Castle Fields, Tonbridge, Kent.
14	Shrewsbury and District MES, Open Day, S.A.H.A. Sports & Social Club, Racecourse Lane, Copthorne, Shrewsbury, Shropshire.
15	Chesterfield & District MES, 'History of British Tramways', Talk by Bob Hall of Crich Museum, Friends Meeting House, Ashgate Road, Chesterfield, Derbyshire.
16	Chingford & District MEC, 3½" gauge Steam Up, Ridgeway Park, Chingford, London.
16	Hull & District SMEE, 'Boilermaking for Idiots', Talk by J D Chilver, YPI Centre, Chanterlands Avenue, Hull, North Humberside.
16	West Riding SLS, Open Steam Running/Evening Barbecue, Bradford Road, Tingley, Wakefield, West Yorkshire.
17	Sutton MEC, Signals Teach-In, rear of 1 Chatham Close, Sutton, Surrey.
18	CRAMEC, Evening Steam Up & Barbecue, Waterside Farm Centre, Canvey Island, Essex.
18	Chesterfield & District MES, Cheese and Wine Evening, Community Centre, Hady Hill, Chesterfield, Derbyshire.
19	Birmingham SME, Evening Barbecue, Clubhouse, Illshaw Heath Road, Hockley Heath, West Midlands.
19/20	Guildford MES, 30th Model Steam Rally & Exhibition, Stoke Park, Guildford, Surrey.
19/20	Royal International Air Tattoo, RAF Fairford, Gloucestershire.
20	Bedford MES, Exhibition Day, Rook Tree Farm (Summerfields), near Haynes, Bedford.
21	Cambridge MES, Model Traction Engine and Road Vehicle Rally, Fulbrooke Road, off Grantchester Road, Cambridge.
21	Peterborough SME, 'The Aims and Achievements of the TTHS Society', Talk by R C S Raine, Thorpe Hall, Longthorpe, Peterborough, Cambs.
24	Leyland SME, 'Tracks & Faces', Video Night with John Barr, The Conservative Club, Towngate, Leyland, Lancashire.
26/27	Cambridge MES, 16mm Rally, Fulbrooke Road, off Grantchester Road, Cambridge.
26	Sutton MEC, Hosts to SMEE, rear of 1 Chatham Close, Sutton, Surrey.
27	Cambridge MES, Visiting Clubs Day and Members' Running Day, Fulbrooke Road, off Grantchester Road, Cambridge.
27	Sandtoft Miniature Railway, Sandtoft Gathering and Isle of Axholme Festival of Transport, Sandtoft Transport Centre, Belton Road, Sandtoft, near Doncaster, South Yorkshire.
27	Whitchurch (Cardiff) & District MES, Open Day, Heath Park, Cardiff, South Glamorgan.
27	Wigan & District MES, Open Day, Haigh Country Park, Wigan, Lancashire.
29	Romney Marsh MES, Clockwise running, 101 Rolfe Lane, New Romney, Kent.
29	Stafford & District MES, Running Night, County Showground, Weston Road, Stafford.
30	Hull & District SMEE, Members' Running Evening, West Park, Anlaby Road, Hull, North Humberside.
31	Sutton MEC, Steam-Up, rear of 1 Chatham Close, Sutton, Surrey.

Readers' Letters . . . Hints & Tips

Correspondents wishing for a personal response to their letters to authors should enclose a stamped addressed envelope which will be passed on to the author.

Dear Sir

In *Engineering in Miniature*, volume 16, number 7 of January 1995, there was a small review of EPP Plastic Products ("for model railway societies looking for materials suitable for fencing, track sleepers, etc."). We have been in contact with EPP at St Helens and a sample of the recycled plastic has been received.

The committee of West Riding Small Locomotive Society is very impressed with the new product. However, before investing our hard earned cash for track sleepers, we would like to know whether any other society has used recycled plastic for track sleepers and whether any unforeseen problems have arisen. Any information would be most welcome.

I can be contacted through the *Engineering in Miniature* office or by telephone on 01226 382874.

Paul Mann, Acting Secretary
West Riding Small Locomotive Society

Dear Sir

I completed building my 'Sweet Pea' in the spring of 1996 and it has performed very well on our club's permanent track and at various fetes during the season. This locomotive has given me and many passengers of all ages a great deal of pleasure and, I think, great credit is due to its designer Jack Buckler.

I am now contemplating my next project and rather fancy the Robey No. 4 Light Traction Engine currently being described in *Engineering in Miniature*. To this end, I should be grateful if you would inform me which, if any as yet, of the model engineering suppliers is marketing the castings, boiler kits etc for this model.

E F Coulson
Shropshire

The editor replies: Castings and drawings for the Robey No. 4 light traction engine are available from the author of the series, Ian Amor, telephone 01872 560802 after 4.00pm.

Dear Sir

I am writing to congratulate you on introducing a new, much needed show into our hobby, namely The London Model Engineers Gathering. The venue was ideal, with free car parking, easy access and admission to the show was good value. It was refreshing to see so much assembled in one place purely for the benefit of the model engineer.

However, I do have one criticism about the show which has nothing to do with the organisation but concerns some of the traders that were present – the trader who displays a box of assorted milling cutters priced from £3 to £10 each, or the trader who has no prices on any of his goods and, when you make your selection, you find that the price is really based upon what the trader thinks you will pay.

For many years model engineering appears to have been the domain of seemingly wealthy retired men, a statement with which your readers will surely disagree. If some of the traders would consider that, without the model engineer to purchase their wares, their business would amount to nothing more than that of a scrap metal merchant, then that would indicate the true value of their goods.

So the point to the trader is: don't be embarrassed by your prices, mark the price on the item and your bank balance at the end of the show will indicate whether you have it right or not – you never know, you may sell something!

B J King
Kent

Dear Sir

I read my copy of the May issue of *Engineering in Miniature* with my usual interest, in particular Malcolm Wright's article on the Kerr Stuart locomotive. I must confess to some surprise that Malcolm does not appear to know that the Association of 16mm Narrow Gauge Modellers has placed a complete boiler test kit in every one of its regions and that the holder (I hold the north east area kit) has full instructions on the procedure for hydraulically testing locomotive gas tanks. The use of any pneumatic test for these, or any other pressure vessels – and that is what Malcolm is describing – is most strongly **not** recommended! The only safe way to carry out a high pressure test of this nature is with water, certainly not with a highly volatile and inflammable fluid like liquid petroleum gas. The published test procedure is definitely **not** likely to bring joy to the hearts of the Health & Safety Executive!

My advice is for the builder to join the Association of 16mm Narrow Gauge Modellers, where he will receive a great deal of assistance, good advice and good fellowship and an excellent quarterly magazine in addition to help with safe testing, free of charge, of boilers and tanks.

Ernie Black
Co. Durham

Dear Sir

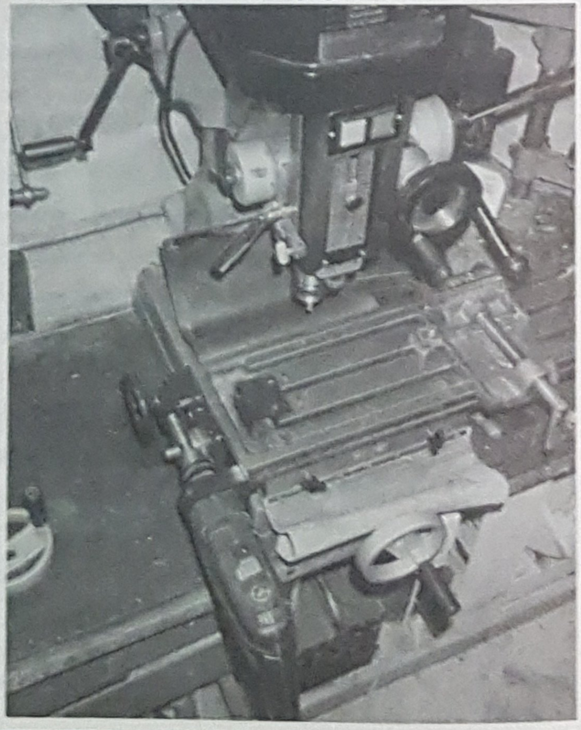
I enclose a photograph of my design of power feed for my milling machine, which has been working without any problems for the last eighteen months.

The yoke securing the Black & Decker variable speed electric drill pivots on a stud to allow the worm, made from a length of $^{3}/_{4}$" Whitworth studding, to engage and disengage with the worm wheel. Locking is obtained by the handwheel (it could be a nut) securing the slotted block supporting the other end of the worm via a couple of ballraces.

The worm wheel was hobbed with a $^{3}/_{4}$" Whitworth tap, the blank diameter being calculated to produce 60 teeth. The drill gives speed control, left and right traverse and yet the drill is still easily removable for those new shelves in the kitchen.

F. E. Payne
Devon

Continued on page 29



The power feed using a Black & Decker variable speed electric drill for Mr Payne's milling machine.

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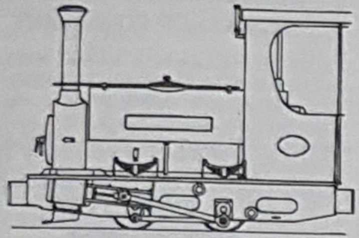

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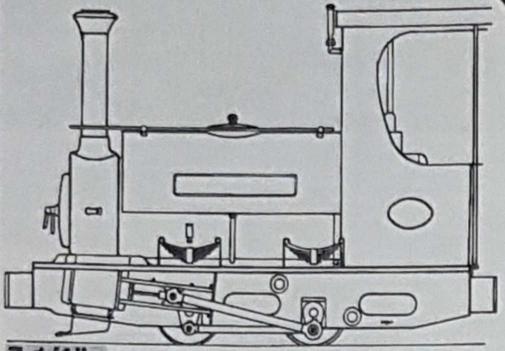

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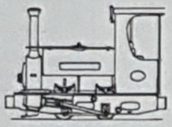

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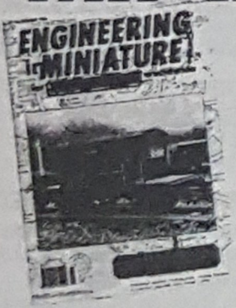

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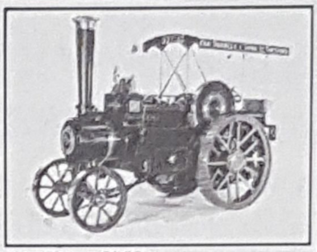

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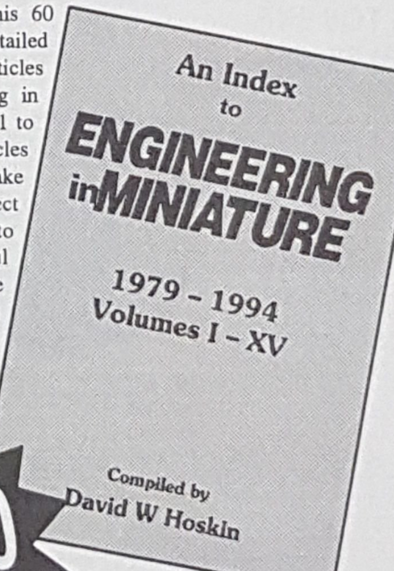

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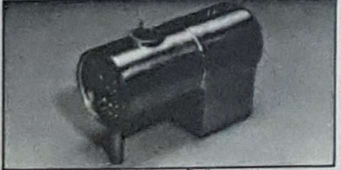

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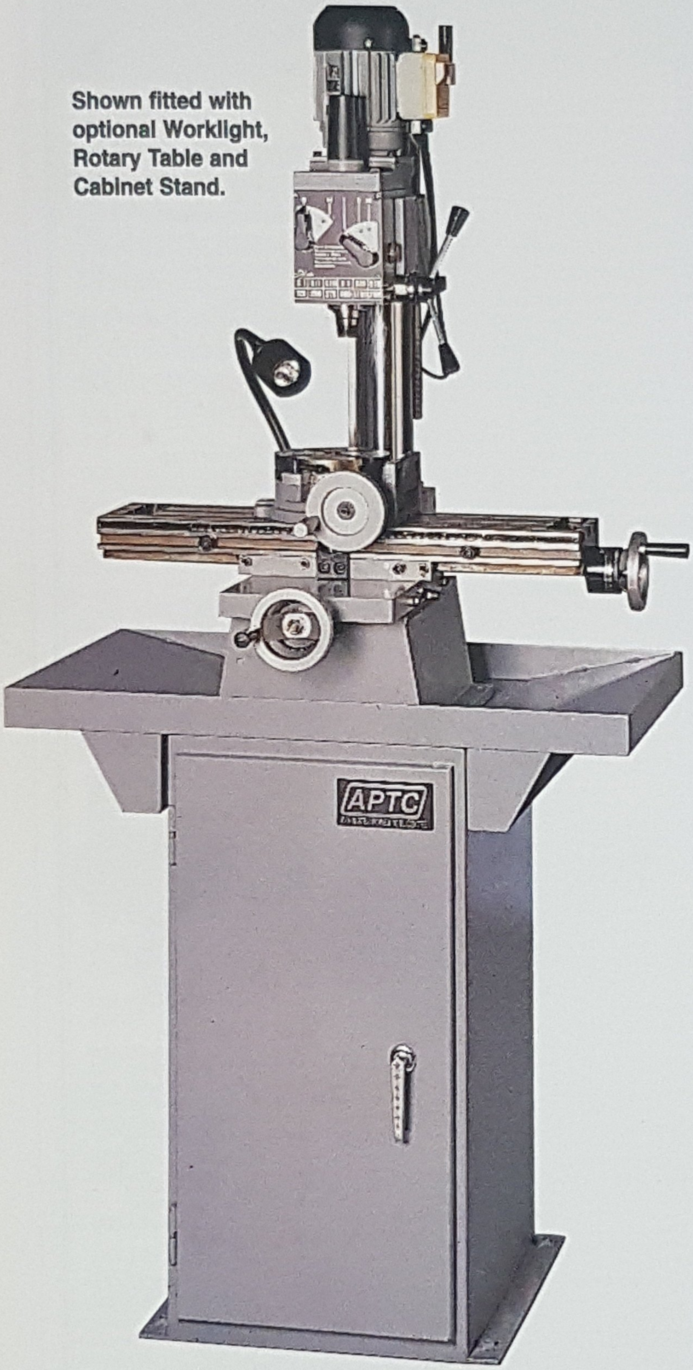

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